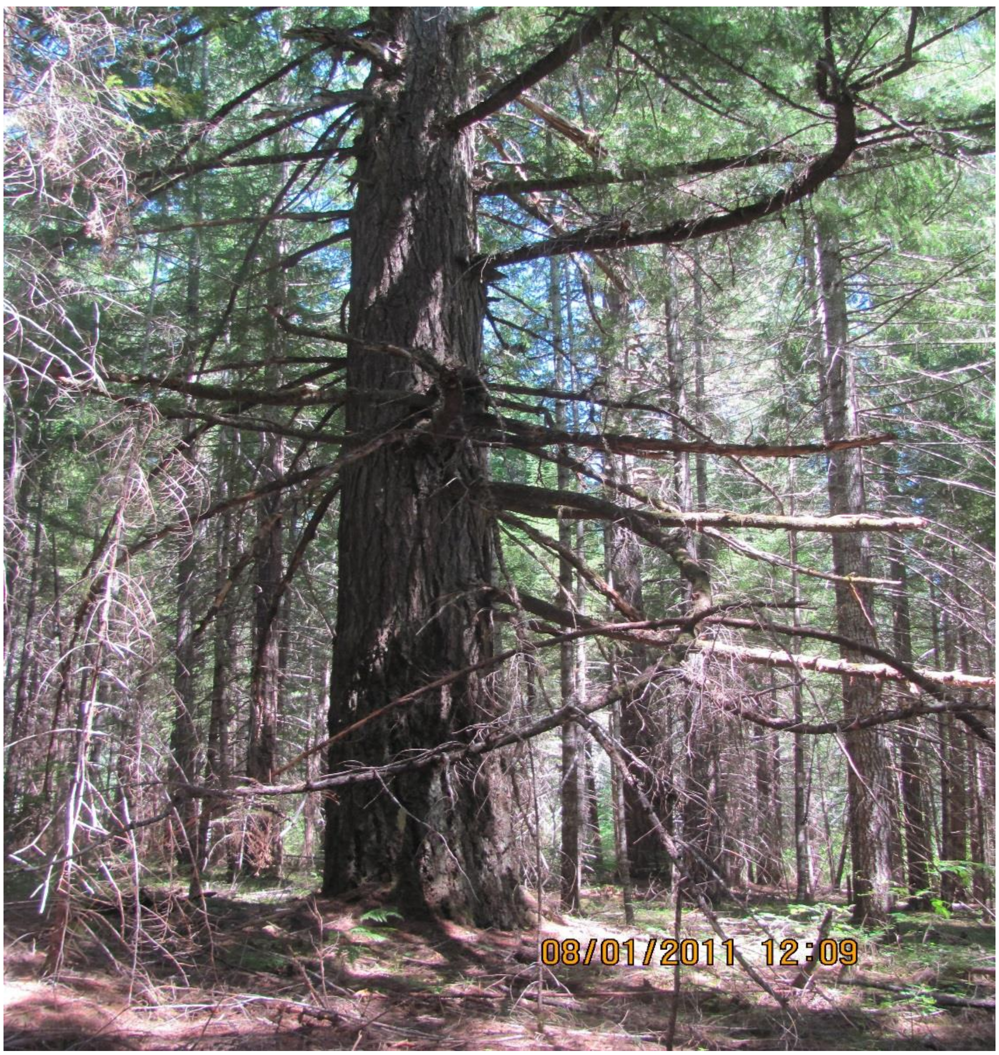
United States Department of Agriculture
Forest Service

Vegetation Report

Upper Briggs Restoration Project

Rogue River-Siskiyou National Forest,
Wild Rivers Ranger District



/s/ Robert Barnhart **Date: April 8, 2018**

Robert Barnhart, Silviculturist

[1] an updated EEO statement (as of 2016).

Contents

Introduction

Proposed thinning and prescribed fire activities for the Upper Briggs Project intend to collectively address needs identified for the watershed and contribute to landscape-level restoration:

1. Develop and enhance late successional habitat structure
2. Retain and restore pine-oak habitats.
3. Restore habitat suitability to retain sensitive plants that are shade-intolerant.
4. Restore meadow systems by treating encroachment.
5. Restore riparian reserves to attain Aquatic Conservation Strategy objectives defined by the Northwest Forest Plan.

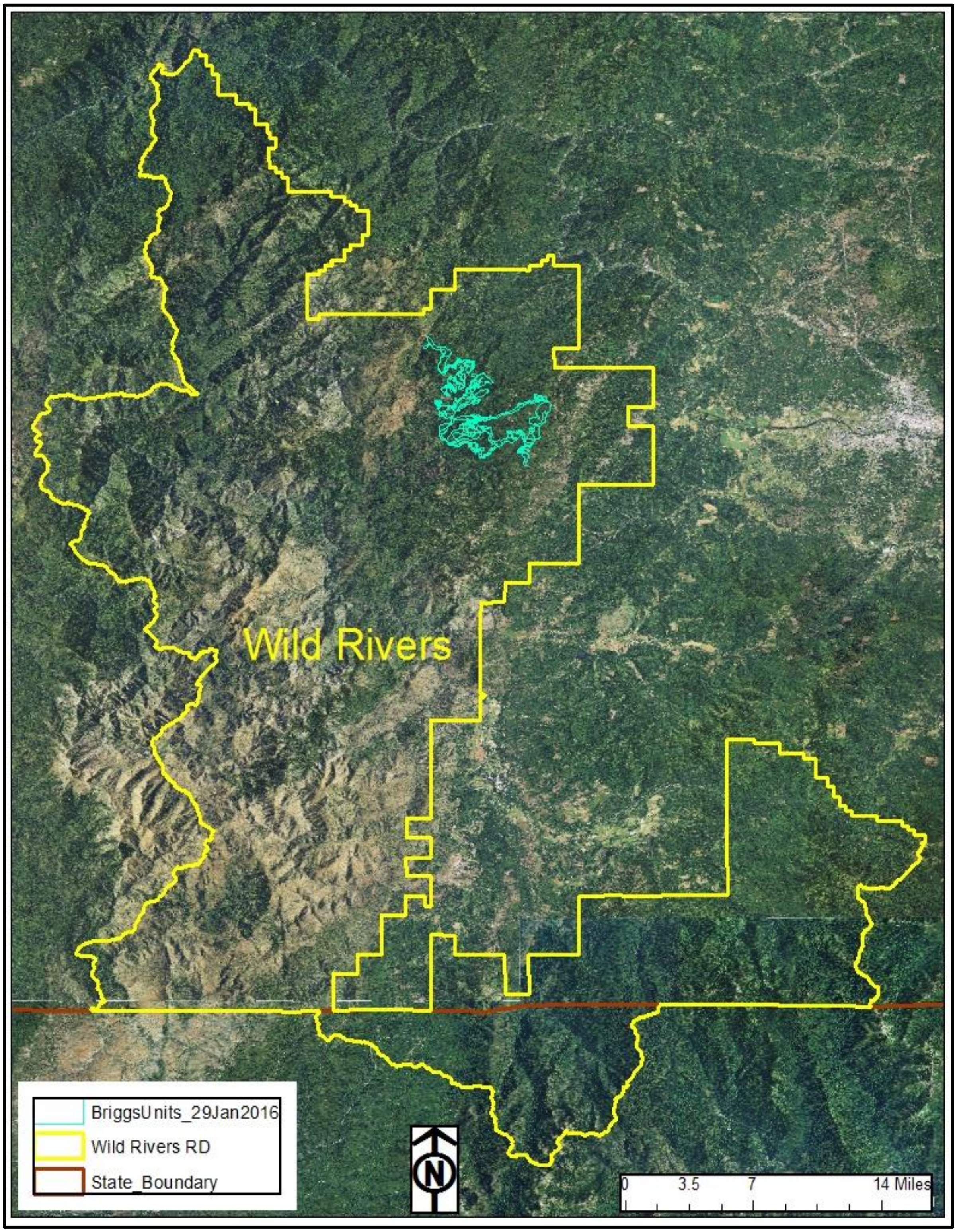
Connected actions include: temporary road and landing construction, road maintenance, timber hauling, and activity fuels management. The analysis area includes matrix, riparian reserves, special wildlife sites and northern spotted owl critical habitat.

Proposed Project Location

This project is located in the Wild Rivers Ranger District, Rogue River-Siskiyou National Forest in Briggs Valley approximately 9 air miles SW of the Rogue River and 13 air miles WNW of Grants Pass, Oregon. The project area lies entirely within the Upper Briggs Creek watershed which is a tributary of the Illinois River.

The total area within the project analysis boundary (red/purple line on Proposed Action map) is 4017 acres. This project is located in Townships 35 and 36 South, R8W, Sections 4,5,6,7,8,16,17,18,19, and 20, W.M. The entire project area is considered non-WUI (not wildland-urban interface). However, the Barr Mine, a160 acre parcel of private land, (including a residence) lies approximately in the center of the general project area. This private parcel is completely surrounded by National Forest lands.

Image 1. Vicinity map



Existing and Desired Conditions

Based on the Briggs Creek Watershed Analysis and the Siskiyou National Forest Plan as amended by the Northwest Forest Plan, late-seral stands constitute approximately 18% of this watershed. It is desired to increase this to a minimum of 45%.

Currently, mid-seral stands exist on approximately 27% of the watershed. This is well above the historic range of 10% -15% for mid-seral stands in this watershed. These mid-seral stands in the project area are overstocked and are at high risk from loss to fire, insects, and disease.

The Upper Briggs Restoration project analysis area is a landscape of great vegetative diversity. Much of the terrain is covered by mixed forests of conifers and broadleaf trees. Land types, soil types, fire regimes and available water capacity play a role in species composition. Many of the units proposed for treatment are in sites that have very low to low available water capacity see soils map in the soils report. Stands that fall in these areas are highly susceptible to insect and disease mortality.

At lower-elevations, Douglas-fir (*Pseudotsuga menziesii*) mixed with Tanoak () and Pacific Madrone () dominate the mid story and understory and Douglas-fir and ponderosa pine dominate the overstory. Ponderosa Pine, California black oak (), Oregon white oak() and canyon live oak() also occur in shallow soils. Ultramafic soils exist in the project area and are confined to the Western edge and a few inclusions to the southeast. For more discussion regarding soils information see the Soils Report. These areas have forest stands on most aspects but is frequently intermixed with other warm site conifers as well as a number of hardwood trees and shrubs. In contrast, stands that occur on ultramafic soils in both lower elevation (need numbers) to high elevation (need numbers) trend to have more open late seral characteristics and are dominated by Jeffery pine and or western white pine (Northwestern to Western side of the project area). The following table reflects the plant associations that occur in the Upper Briggs restoration project (this table is not exhaustive of all associations that may occur in the project area, data derived by stand examinations).

Table 1. Table of Plant Associations (PA) translated to Plant Association Groups (PAG).

OLDPA1996		**PAG Code**	**PAG Name**
PIJE/CECU/FEID	Jeffrey pine/buckbrush/Idaho fescue	PIJE/CECU/FEID	Jeffrey pine/grass
PIJE-CADE27/ARVI4	Jeffrey pine-incense cedar/sticky whiteleaf manzanita	PIJE-CADE27/ARVI4	Jeffrey pine-incense cedar
PSME/DRY SHRUB	Douglas-fir/dry shrub	PSME/2SHRUB	Douglas-fir/poison oak-warm, often low elevation
PSME/HODI/WHMO-SWO	Douglas-fir/oceanspray/common whipplea	PSME/HODI/WHMO	
PSME-QUCH2-LIDE3	Douglas-fir-canyon live oak-tanoak	PSME-QUCH2-LIDE3	Douglas-fir-canyon live oak-cool, dry - SWO

PSME/ARNE-SWO	Douglas-fir/pinemat manzanita (southwest Oregon)	PSME/ARNE	
LIDE3-PSME-QUCH2/RHDI6	tanoak-Douglas-fir-canyon live oak/Pacific poison oak	LIDE3-PSME-QUCH2/TODI	Tanoak-canyon live oak and/or Sadler oak
ABCO-LIDE3/CHUM	white fir-tanoak/pipsissewa	ABCO-LIDE3/CHUM	White fir - cool, dry
ABCO-PSME/ROGY	white fir-Douglas-fir/dwarf rose	ABCO-PSME/ROGY	White fir-Douglas-fir - warm, dry

While Douglas-fir trees are likely to grow in upper elevation stands in moderate numbers, white fir (*Abies concolor*)/grand fir (*Abies grandis*) trees typically comprise an understory in a high elevation stand. Throughout the analysis area, and scattered among forest stands at both low and high elevations, are open areas that sustain a remarkable number of locally endemic plants. Each plant community growing within the analysis area (whether human-shaped or natural) is segregated along gradients of elevation, aspect, soils and topography and is directly affected by vital plant growth determinants such as temperature, effective precipitation and hydrologic regime.

As a way to portray existing vegetation conditions in and near proposed activity areas, **four generalized cover types are described**. Cover types attempt to characterize areas of vegetation that are alike in outward appearance and structure (i.e., where there is floristic and plant size constancy in all vegetative layers) or that are similar in ecologic condition (i.e., where disparate vegetation sizes or species are unified by one prevailing environmental trait or group of similar traits). Each cover type is described using attributes such as plant size, dominant vegetative form (grass, shrub, small tree, etc.), plant species composition, an environmental trait or any combination of these that are constant across the cover type.

The four cover types described for the Upper Briggs Restoration Project Analysis Area are: 1), young (immature) forests, 2), intermediate-age/closed canopy forests, 3), mature and old-age forests, and 4), meadow, barren, talus, alpine or other open areas. As descriptive classifications, cover types are intended to convey an extensive and generalized picture of the key plant complexes (communities) present in the analysis area. However, they are not intended to classify potential climax vegetation for a site and are not synonymous with plant association or potential natural community. Likewise, cover type descriptions are much too broad to identify specifics of plant composition and structure at the level of any individual stand or single site.

All of these descriptions have been created using the local knowledge of Forest Service personnel working in the area in combination with vegetation descriptions provided by Whittaker (1960). Stand information was gathered to include stand examination surveys completed as part of Upper Briggs Restoration project that occurred in 2007, 2011 and 2015. Information was also gathered from watershed analyses completed for the Upper Briggs Creek drainage that encompasses the analysis area (USDA 1998,).

1. Young (immature) Forests Cover Type

This cover type includes all forest stands where the average age of the dominant trees is one to 35 years old. Primarily, stands in this cover type (within the analysis area) are conifer plantations that were established following clearcut harvesting. Notably, though, numerous young stands in the southwest portion of the analysis area were regenerated in the wake of a recent, large wildfires (Horse Mountain, Oak Flat and Onion Mountain). Characteristically, then, nearly all of this cover type is composed of young stands that are relatively uniform, human-shaped forests of even-aged trees with a single main canopy layer. At present, there are just a few plantations in the analysis area that are younger than 20 years old because only a few regeneration harvests were completed during the past 20 years. Image one shows a young stand of predominantly Douglas-fir trees that is representative of the oldest plantations in this cover type within the analysis area.

Image 1. Young stand of primarily Douglas-fir located within the Upper Briggs Restoration Project Analysis area.

Insofar as the tree sizes found in these stands, this cover type is typically comprised of saplings (stems 0.5 to 3.9 inches diameter at breast height {DBH} and 10 to 25 feet tall) and poles (stems 4 to 8.9 inches DBH and 25 to 55 feet tall). Seedlings (trees less than 0.5 inch DBH) are common or abundant in the youngest stands but nearly all stands in the analysis area have grown beyond the seedling stage. In many plantations, remnant large or very large live trees or snags are either absent or present in low numbers within the interior of the stand (except in the recent fire areas to include Horse mountain, Oak flat and Onion Mountain). Similarly, residual coarse woody debris is seldom abundant within these plantations. Douglas-fir usually predominates in most plantations and this species typically composes 60 percent or more of all trees growing on a site.

At lower elevations (below 4,000 feet), one or a few other conifers typically grow in association with Douglas-fir trees including ponderosa pine, sugar pine (*Pinus lambertiana*), Port-Orford-cedar (*Chamaecyparis lawsoniana*) and incense-cedar (*Calocedrus decurrens*). At upper elevations (above 4,000 feet), or on cooler mesic sites at lower elevations, conifer variety is greater and young forests are characteristically composed of more conifer species. Douglas-fir may still comprise a substantial proportion of all trees in a stand but numerous other tree species are likely to be common constituents of the stand as well. These mixed stands typically have four to seven conifers present and this diversity of species may include white fir/grand fir, Shasta red fir (*Abies magnifica* var. *shastensis*), noble fir (*Abies procera*), mountain hemlock (*Tsuga mertensiana*), Brewer spurce (*Picea breweriana*), western white pine (*Pinus monticola*) and knobcone pine (*Pinus attenuata*) as well as the sugar pine, Port-Orford-cedar or incense-cedar that grows also at lower elevations.

Broadleaf trees and shrubs are frequent members of immature stands in this area and are intermixed with conifers generally, sometimes in abundance. Lower elevation stands tend to contain numerous broadleaf trees and shrubs that thrive on warm, drier sites. Often plentiful in lower elevation plantations are trees such as California black oak (*Quercus kelloggii*), Oregon white oak (*Quercus garryana*), tanoak (*Lithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*) and canyon live oak (*Quercus chrysolepis*), as well as shrubs such as manzanita (*Arctostaphylos* spp.), Oregon grape (*Mahonia aquifolium*) and poison oak (*Toxicodendron diversilobum*). At upper elevations, plantations typically have fewer broadleaf tree and shrub species but golden chinquapin (*Chrysolepis chrysophylla*), snowbrush (*Ceanothus velutinus*) and currant (*Ribes* spp.) persist in these areas.

2. Intermediate-age/Closed Canopy Forests Cover Type

This cover type includes all forest stands in the analysis area where the average age of the oldest trees is 35 to 120 years. Stands in this cover type, like the young forests just described, are primarily plantations that were regenerated following clearcut harvesting. Therefore, many stands in the intermediate-age cover type are less than 60 years old (currently) because nearly all logging in the area has taken place since the end of World War II (1945). However, numerous stands in this cover type naturally reestablished in the aftermath of wildfires or hydraulic mining operations that occurred near the beginning of the last century.

Most stands included in this cover type (within the analysis area) regenerated following human-disturbance events and are relatively uniform, even-aged, single-story forests of intermediate-aged trees. For those stands younger than 60 years old, most were revegetated, at least in part, by planting one or a few species of conifer seedlings. On the other hand, reforested stands older than 60 years generally had their genesis from naturally dispersed seed and are more likely to contain remnant trees from the former forest. Figure 2 shows a young stand of predominantly Douglas-fir trees that is representative of the oldest plantations in this cover type within the analysis area.

Image 3. Intermediate-age/Closed Canopy stand of primarily Douglas-fir located within the Upper Briggs Restoration Project Analysis unit 10.

While stands in this cover type do differ in their genesis (that is, stands vary as to whether they were regenerated mostly by planting, natural seeding or by a combination of both planting and natural means), the crowns of the dominant conifers are now tightly interlaced (that is, ‘closed’) and therefore little light penetrates to the ground through the overhead canopy. The close association of crowns presently owes to the generally excessive density of trees growing in most stands of this cover type. In most stands of this cover type, particularly where either a thin has never occurred or a thin occurred more than 20 years ago, the average diameter of existing conifers exceeds 10 inches and the numbers of existing stems range from approximately 150 to nearly 400 trees per acre. The total live tree cross-sectional basal area per acre in most stands is typically 200 to 300 square feet.

Regarding the usual tree sizes found in these forests, small-sized trees (boles 9 to 15.9 inches DBH and 55 to 90 feet tall) and medium-sized trees (boles16 to 23.9 inches DBH and 90 to 125 feet tall) predominate in managed stands under 60 years of age. However, large-sized trees (boles 24 to 31.9 inches DBH and 125 to 150 feet tall) are occasional members of stands that are close to 60 years old and large-sized trees are increasingly common in stands aged 80 years and older. Across the entire age range of stands in this cover type, remnant large, very large (boles 32 to 44.9 inches DBH and 150 to 200 feet tall) or giant live trees or snags (boles 45+ inches DBH and 200+ feet tall) are seldom present in large numbers within the interior of the stand. The species composition of forest stands within this cover type is similar to the tree compositions described above for young, immature stands.

Nevertheless, there are modest but widespread differences in tree species makeup that are recognizable between the young plantations and the intermediate-age stands of this cover type. These differences in composition are largely attributable to three factors: 1), natural differentiation in height growth among tree species, 2), pre-commercial thinnings that were applied to many stands during early development, and 3), planting of some sites almost entirely with ponderosa pine. The first two factors have contributed to stand compositions that, on average, include an increased proportion of Douglas-firs when compared to stands less than 35 years old. In intermediate- age stands, Douglas-fir often comprises 70 percent or more of the dominant and codominant trees in the overstory. The intrinsic height growth capacity of Douglas-fir, as well as the customary tendency to favor this species during thinning, tends to augment the proportion of Douglas-fir in the overstory in comparison to stands in the youngest cover type. The third factor, planting ponderosa pine almost exclusively on a site, has created a number of managed stands where the overstory is composed of 70 percent or more ponderosa pine. Most of these stands were planted in the late 1950's or 1960's and hence are roughly 40 to 50 years old. Undesirably, the pines planted to reforest these stands are now growing poorly. Moreover, the existing pines are regarded as off-site because the trees are not the progeny of local seed and these pines appear to be mal-adapted to the sites and elevations where they were planted. Thus, nearly all of the ponderosa pine plantations (at middle elevations) in this cover type are exceptional in that they represent a compositional anomaly not repeated in younger or older forests in the analysis area.

Among all stands in the intermediate-age cover type, firs, pines or cedars are commonly but variously intermingled with the predominant Douglas-firs. However, even when those conifers other than Douglas-fir make up a sizeable percentage of the forest, these other trees are seldom preponderate in the existing (dominant or codominant) overstory except in the just-described pine plantations or at upper elevations (above 4,000 feet). In addition, and as is characteristic for mid-seral but maturing forests generally, most trees of all the species that comprise a stand have few bole or crown defects. The most prevalent defect seen in the boles of trees growing in intermediate-age stands is top breakage caused by snow and ice buildup in the upper crown. Where the breakage occurred 25 years or more in the past, the deformity that is frequently recorded for formerly ice-broken trees is an upper bole that has a forked or "bayonet" top. Generally, too, within most stands of this cover type, individual boles are separated somewhat from neighboring stems; only infrequently are there couplet or triplet sets of stems growing closely together in a tight group. Also, stem diameters among most dominant and codominant trees in the overstory frequently vary within a relatively narrow diameter range of three to six inches. Intermediate-age stands having two distinct age-classes and two canopy layers are rarely present.

However, where two-story stands exist in the analysis area they are, almost without exception, the result of previous partial cutting. Only occasionally in this cover type do remnant trees from the former forest endure locally as individuals or in small groups. Where they are encountered, older trees persist in current forest stands because they survived the last stand replacement (disturbance) event (wildfire, logging, etc.). When present, remnant trees from the former forest usually occupy the superdominant canopy position. Typically, trees exceeding 200 years old are virtually absent in intermediate-age stands but, where remnant trees are present, the distribution of these superdominant trees is usually widely dispersed and irregular. Existing "hard" snags that are medium-sized and larger (that is, snags with diameters larger than 16 inches) are almost completely absent within the closed canopy stands within the analysis area. Hard snags are those dead trees with most limbs attached where the heartwood is mostly sound but the sapwood may have evident decay or deterioration.

On occasion, though, particularly in low elevation stands, a few recently-killed trees 16 inches DBH and larger may be present (perhaps as a consequence of drought combined with high stand density). Similarly, large standing-dead trees in an advanced state of decomposition, usually described as "soft (rotten)" snags, are irregular enough in this cover type to be considered rare. The explanation for the general lack of hard and soft snags in intermediate-age stands is related to the mid-seral development, relative vigor and comparative youth of forests in this cover type. Until now, through what is termed by Oliver and Larson (1996) as the stand initiation and stem exclusion phases of stand development, there simply has not been sufficient time, or loss of tree vigor, for mortality agents (insects, disease, wind, ice, competition, etc.) to act upon and kill dominant and codominant trees. Of course, without standing-tree mortality (hard snags) in the overstory, there is no current source for recruitment of large soft snags. In most stands presently, coarse woody debris is depauperate and such large material as exists is often highly decayed. Nonetheless, in some stands, especially stands that are currently 45 to 60 years old, coarse woody debris is substantially more abundant than is usual for this cover type generally. Where a large quantity of intact coarse wood persists, the debris is typically (cull) material that was left during logging and many of the logs present are very large or giant cedars (which decompose slowly).

A number of forest tree pathogens are ubiquitous throughout the analysis area and their injurious effects to a few trees are regularly discernible in intermediate-age stands. On the other hand, substantial mortality of overstory trees associated with these pathogens is seldom in evidence at this stage of forest growth and development, with the exception of tree killing caused by root diseases. Two root diseases in particular, Port-Orford-cedar root disease (*Phytophthora lateralis*) and laminated root rot (*Phellinus weirii*), are persistent in the analysis area. These two root diseases are lethal to their primary hosts and can kill a sizeable number of susceptible trees within a limited area. Indeed, isolated pockets of host trees killed by these two root parasites are found across all stand types across the Upper Briggs Analysis area. Image four displays a group of Port-Orford-cedar infected with *Phytophthora lateralis* within a road prism.

Image 4. Port-Orford-cedar tree group with infested with *Phytophthora lateralis.*

Three additional root decay organisms, shoe string root rot (*Armillaria ostoyae*), Annosus root disease (*Heterobasidion annosum*) and black stain root disease (*Leptographium wageneri*), are also present and widespread in the analysis area but their influence is subdued in most intermediate-age stands. Another group of tree parasites, dwarf mistletoes (*Arceuthobium* spp.), commonly infest Douglas-fir, ponderosa pine and true firs (*Abies* spp.) in the analysis area. While dwarf mistletoes are present in many stands, infestations are only irregularly prevalent in trees growing in this cover type. Occasional stem decays have been identified in many tree species, during stand examinations, but the extent of heart rots in trees of this cover type is quite limited.

3. Mature and Old-age Forests Cover Type

This cover type includes all forest stands in the analysis area where the average current age of the dominant trees are more than 120 years old. Some stands are present in this cover type where the age of existing trees exceeds 300 years (for example, trees within Big Pine Campground). This cover type is distributed throughout the analysis area but is more frequently encountered on northern to easterly slopes and or highly productive soils (i.e. high water storage potential). In mature and old-age stands generally, the extended persistence of these stands on the landscape provides for greater structural complexity and tree species variety than is found in the younger forest cover types.

The tree species contained within the forest stands of this cover type are the same as those trees described above within younger stands. However, the composition of species in any specific stand is far more variable from site to site as a consequence of overstory tree mortality and understory in-growth of more recently established trees. Shade-tolerant trees, including grand/white fir, tanoak, and mountain hemlock (high elevation), are likely to compose at least 25 percent of the basal area within mature and old-age stands. In the youngest stands within this cover type, a mid-level canopy layer may be just emerging as a noticeable stand feature or an understory layer may be quite evident and well-developed. A well-developed middle canopy is nearly always present in stands over 200 years old. Stands in the oldest age classes (with trees over 300 years old) typically contain multiple canopy layers beneath the dominant crowns and they have a complex vertical structure consisting of trees ranging in size from small to giant. In addition to two or more distinctive canopy layers, stands in this cover type usually contain trees having a higher incidence of crown deformities, bole defects and decaying wood ("decadence") when compared to trees in younger stands. Lop-sided crowns, crooked trunks, bark scrapes, seams and burls define a partial list of the malformations readily encountered among trees growing within these stands. As well, trees of any species may have dead tops, broken tops or multiple-stem tops. In many stands, too, at least a few of the largest overstory trees have died, which in turn creates occasional and dispersed large snags (both hard and soft). The accumulation of large logs on the ground is usually extensive in stands older than 200 years but coarse woody debris may not be plentiful in stands close to 120 years old. Stem decays, limb cankers, butt rots, root rots and dwarf mistletoe infestations are often prevalent in forests of this cover type. These tree pathogens provide hollows, loosened bark, soft heartwood, witch's brooms and large limbs that are vital habitat elements for wildlife nesting/denning, foraging and roosting/sheltering. Numerous species of birds and mammals associated with late-successional forest make their homes in stands of this cover type (for more information about wildlife species that reside in this forest type refer to the wildlife section of this analysis).

4. Meadow, Barren, Talus, Serpentine or Other Open Areas Cover Type

The sparsely treed or non-forested areas of the Upper Briggs Restoration Analysis Area include shrub, forb and grass dominated plant communities as well as rocky areas. Figure four depicts rock outcrop of in the Onion Mountain.

These savanna or non-forest areas are located at scattered locations throughout the analysis area, from relatively low elevation (for example, open areas in Horse Creek meadow) to areas on the uppermost ridges (for example, areas in and near to the). Figure five depicts a high elevation meadow located in the Greyback Mountain Botanical area.

Image 5. Meadow system Horse Creek Meadow (Credit audubonportland.org 2017).

For the most part, these natural openings are limited in area extent. However, within these non-forested openings, a variety of interesting, unusual and rare shrubs, forbs and grasses often are concentrated. A sizeable number of these plant species are Siskiyou Mountain endemics that have limited geographic ranges and are not found elsewhere.

Many (perhaps most) of the open habitats are associated with ultramafic soils, which are prevalent in the west to northwestern portion of the watershed, but also are situated on high exposures on ridges the east side of the analysis area.

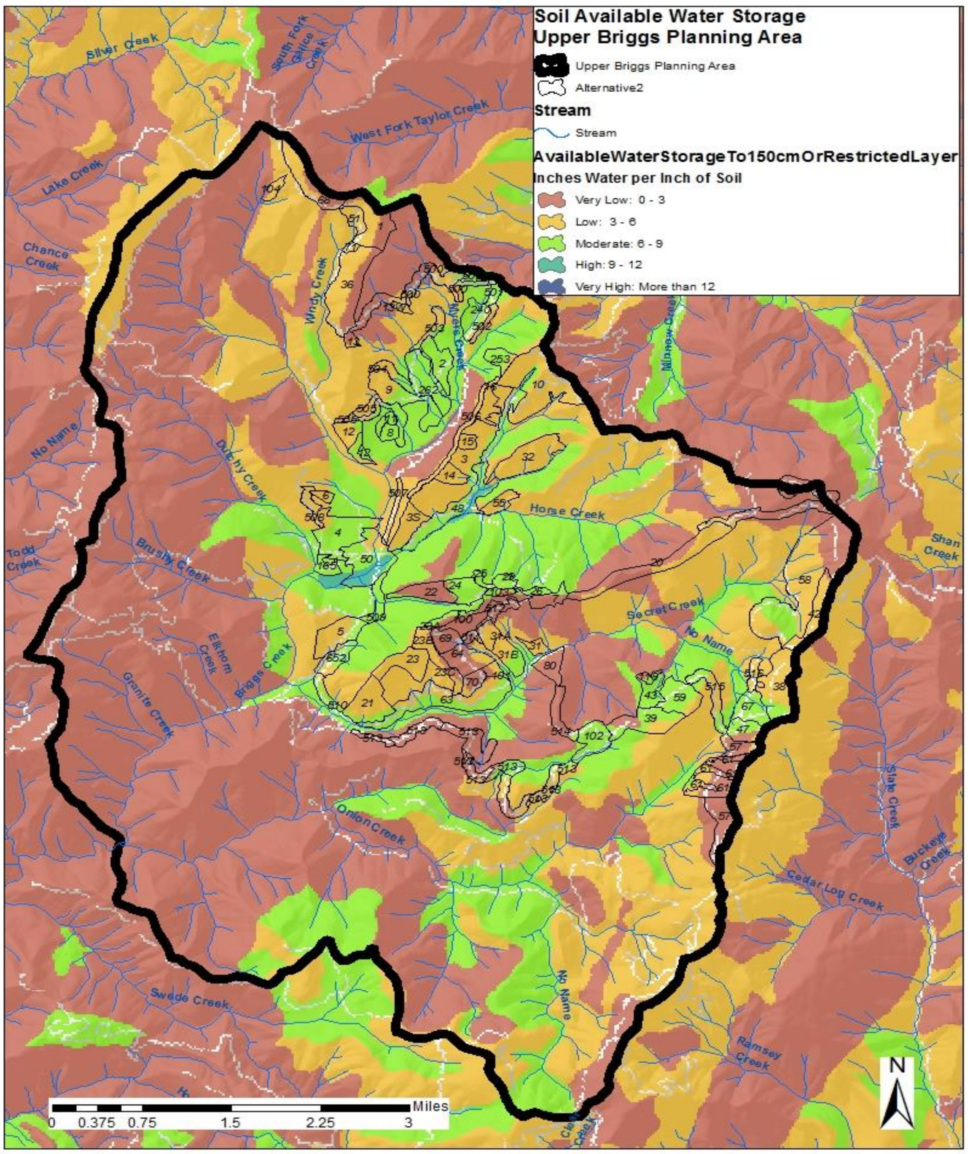

Image 6. Serpentine Rock outcrop (credit oregonencyclopedia.org 3/2017)

The combination of this distinctive geology and a wet winter/dry summer maritime climate, which intermingle in southwest Oregon, is responsible for the exceptionally diverse assemblages of plants living in these open areas. The vegetation supported at any one site frequently forms a unique plant complex because of local variations in elevation, aspect, slope and moisture. In addition, special habitats such as fens, cliffs and rock outcrops are sometimes present in these open areas or are immediately adjacent. Consequently, this cover type contains individual and varied floras that are not present within other or far more common habitats on the Forest. One conifer, Jeffrey pine (*Pinus jeffreyi*), is a common but sparsely distributed inhabitant of serpentine soil areas but this tree is seldom present as a constituent in the forest cover types described above. Jeffrey pines thrive in the comparatively skeletal, infertile and xeric soils derived from ultramafic rock. Western white pine (*Pinus monticola*) is also found in higher elevations along the western boundary of the project area on Chrome Ridge. However, incense-cedar, which is a regularly found in forest stands described above, is also a widespread and locally prominent associate of Jeffrey pine on ultramafic soils. (for more information on soils that exist in the analysis area please refer to the soils report).
Although an exhaustive inventory of the many unique plants that grow in open areas cannot be detailed, a few representative plants are listed here to exemplify the diversity of this cover type. At lower elevations, Siskiyou fritillaria (*Fritillaria glauca*), , opposite-leaved lewisia (*Lewisia oppositifolia*), are a few of the rare or limited-range plants that can be found. On the other hand, many uncommon plants grow only in openings or special habitats at upper elevations. Included in this group are Applegate's gooseberry (*Ribes marshallii*), Matthew's cypress (*Cupressus bakeri* ssp. *matthewsii*), strawberry saxifrage (*Saxifraga fragarioides*), Vollmer's lily (*Lilium volmeri*), broad-bracted globe mallow (*Iliamna latibracteata*), grape fern (*Botrychium* spp.), Lee's lewisia (*Lewisialeana*) and Howell's lousewort (*Pedicularis howellii*). Some uncommon plants, though, such as California pitcher plant (*Darlingtonia californica*), Siskiyou monardella

(*Monardella purpurea*) and Howell's fawn lily (*Erythronium howellii*), can be encountered at both low and high elevations within the analysis area because these plants have a relatively wide ecological tolerance (amplitude). (Please review the botanical report for more information on plant species that occur within the analysis area)

Other Abiotic and Biotic factors to consider

Stands that reside in high occupancy (≥55% percent of maximum Stand Density Index [SDI]) tends to be at risk for insect and disease agents (need citation). Insect and diseases naturally attack weakened trees that have lost the ability to resist attacks, weakened trees are trees that have undergone either mechanical, competition based or abiotic stress (Schaupp 2016). These high occupancy stand conditions are exacerbated by long duration drought and lead to



increased

Image 7. Soils map of available water storage capacity for the Upper Briggs Restoration Project.

mortality. Stands that are at the highest risk for insect and disease occur in areas that have very low to low available water storage within soils. Stands that are located in areas of low water availability are mapped and displayed in image eight (for more information regarding soils see the soils report)

The following images reflect Flat head Fir Borer habitat suitability for the project area. The first image is of the southern half of the project area. The red areas on the maps display habitat for fir borer and the green dots are aerial detection survey completed in 2016.

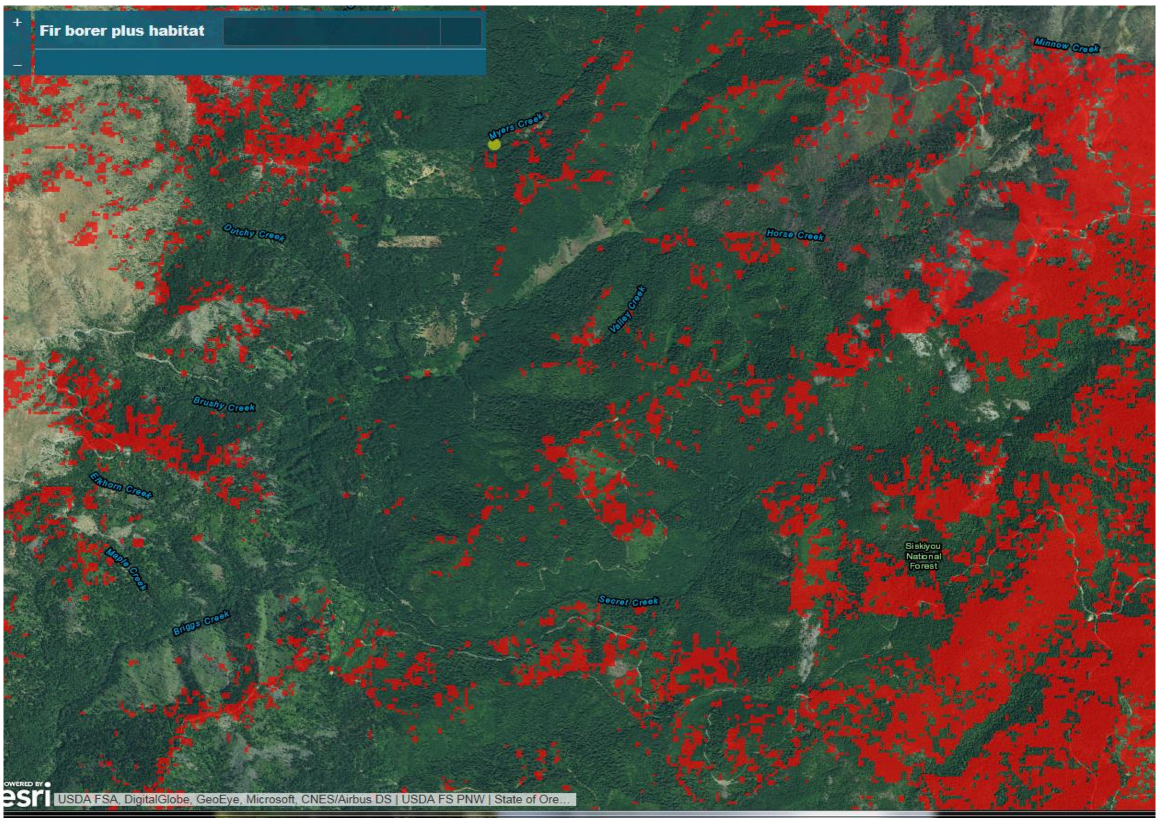


Image 8. Flat headed fir borer habitat southern half of project area

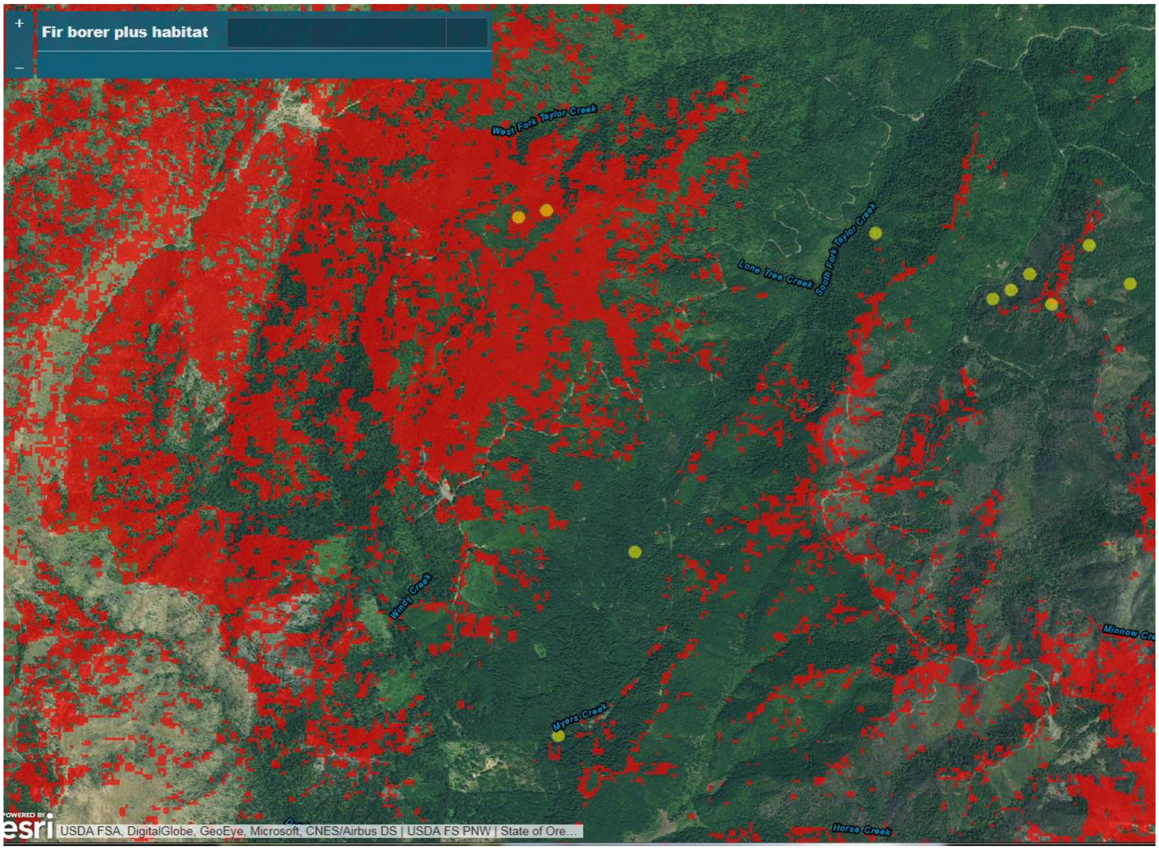


Image 9. Flat headed fir borer activity northern half of project area.

A Southern Oregon Forest Insect and Disease Service Center conducted a service trip to the Briggs valley area on May 5, 2014 and found flatheaded fir borer *Phaenops drummondi*, *Armillaria ostoyae*, *Phellinus weirii* and evidence of past *Dendrotonus brevicomis* activity in the area. Recommendations from the group pointed to stands that they visited were “based on basal area per acre, are greater than those where competition-mediated mortality is expected to begin.” Their recommendations are that “the basal area threshold for elevated risk of pine bark beetle infestation in southwest Oregon on a highly productive site is 120 to 150 Ft^2/ac” (See appendix D for letter).

Fire

Wildfire presents the greatest risk of late-successional habitat loss in this CHU (USDA USDI 1999). This was exemplified in the summers of 2002, 2009, 2011 and 2015 with the Biscuit, Oak Flat, Horse Mountain and Onion Mountain Fires along with various lightning strikes located along ridge tops (i.e. Rattlesnake springs, a lightning strike caused fire is in southwest portion of the proposed ridge top Roadside FMZ). Fire has played a major role in shaping the landscape in this project area. See fuels report for more information regarding fire effects.

An example of landscape fire scar patterning in the roadside FMZ is seen in the 1940 aerial photograph below.

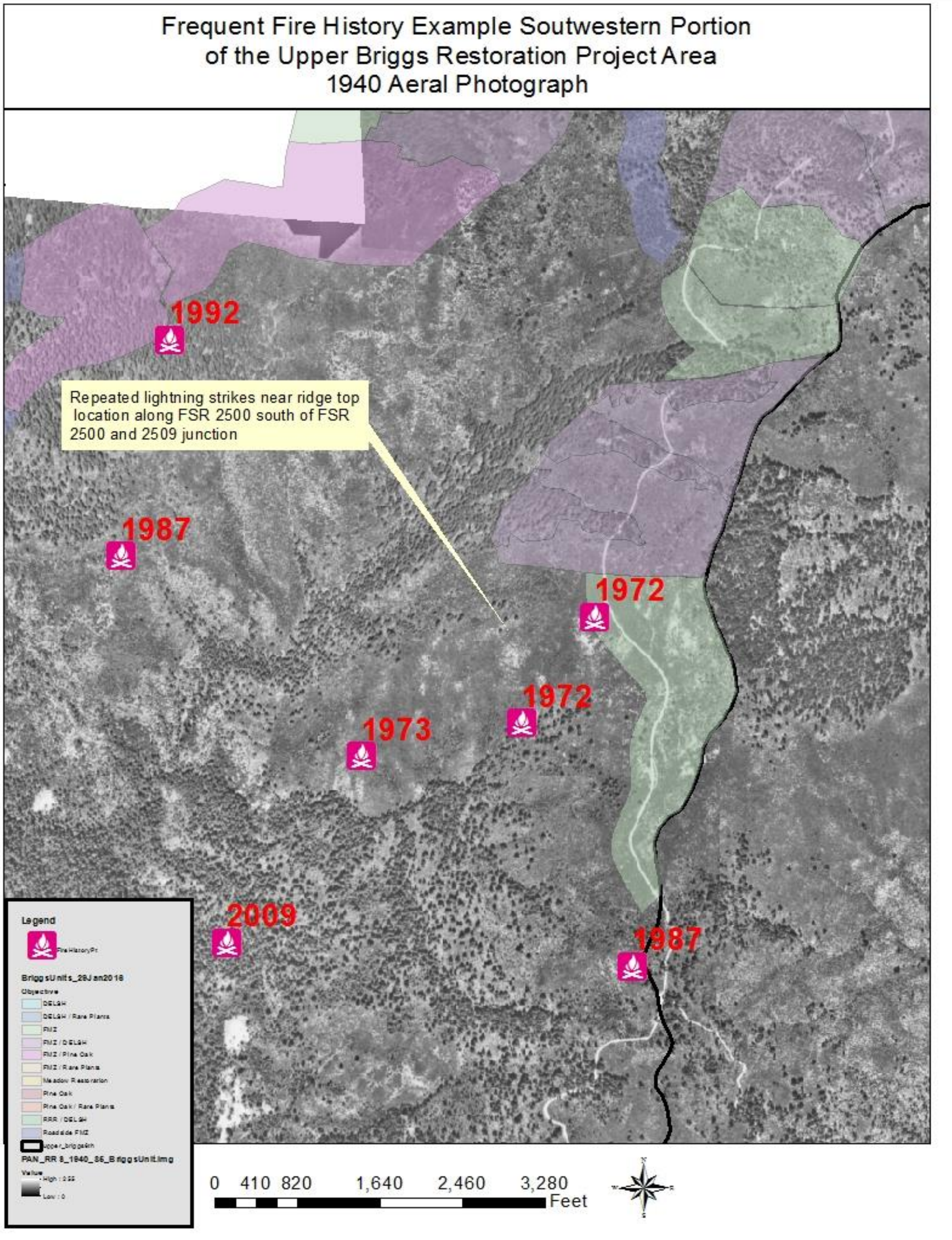


Image 10. Spatial patterning of fire scares in the southeast portion of the project area.

Land and Resource Management Direction

Table 3 displays the acres of land use allocations from the Siskiyou Forest Plan (USDA Forest Service 1989) as amended by the NWFP. Fifty-five percent of the watershed is in matrix lands. Late successional reserve and riparian reserves make up 17% and 19% respectively, and approximately 8% is botanical area and special wildlife sites while less than 2% is private land.

Table 3. Upper Briggs Creek Watershed Forest Plan Land Use Allocations (NWFP allocations in bold)

LUA	Acres	% Watershed
Administratively Withdrawn:	**1944**	**8**
Botanical Area	164	<1
Special Wildlife Site	1780	7
Matrix:	**13,452**	**55**
Matrix	11,237	46
Partial Retention Visual	2,089	8
Late Successional Reserve*	**4,332**	**17**
Riparian Reserve	**4,578**	**19**
Private Land	**446**	**<2**

Figure 6. Land management allocations that underlie the Upper Briggs Creek Analysis area.

Regulatory Framework

The proposed action has been reviewed and is determined to be in compliance with the management framework applicable to this resource. The laws, regulations, policies and Forest Plan direction applicable to this project and this resource are as follows:

Table 2. Review of planning documents applicable to the analysis area

Consideration	Evaluation Conclusion

Siskiyou National Forest Plan 1992	The proposed action would comply with the Standards and Guidelines of the following allocation: General Forest, Matrix 14 Timber to meet long-term Forest-wide timber production and harvest scheduling goals, the FORPLAN model selected a combination of timber management intensities for the Management Allocation. The Allocation was assigned three different harvest strategies, Intensive, moderate and extensive timber management. Objectives include Provide multiple use development opportunities and a high yield of timber, subject to multiple use constraints Matrix partial retention visual Protect scenic values while providing multiple use development opportunities that are visually subordinate to the characteristic landscape The upper Briggs project area does not propose regeneration harvest for the proposed objectives. The upper Briggs project area include foreground and background visual objectives. Riparian reserves Protect intrinsic values of ecosystems bordering bodies of water and wetlands while providing limited multiple-use development opportunities. Special wildlife site Provide an array of unique plant and animal conditions that contribute to overall wildlife habitat diversity see Wildlife report for more information
Northwest Forest Plan 1996	The proposed action would comply with the Standards and Guidelines of the following land allocations: Matrix- Matrix partial retention visual- as noted above Riparian Reserves- Timber Management TM-1. Prohibit timber harvest, including fuelwood cutting, in Riparian Reserves, except as described below. Riparian Reserve acres shall not be included in calculations of the timber base. Standards and Guidelines C-32 b. Salvage trees only when watershed analysis determines that present and future coarse woody debris needs are met and other Aquatic Conservation Strategy objectives are not adversely affected. c. Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. Special Wildlife Site Provide an array of unique plant and animal conditions that contribute to overall wildlife habitat diversity see wildlife report for more information
Spotted Owl Recovery Plan	The proposed action would comply with the following Critical Owl Habitat Unit (CHU) see Wildlife report for more information regarding timber harvest objectives in the CHU

Aquatic Conservation Strategy objectives of the Northwest Forest Plan	The hydrology and fisheries specialist reports address compliance with the Aquatic Conservation Strategy objectives. All alternatives are consistent with the ACS objectives. Treatments in allocation follows the Aquatic Conservation Strategy. Stands in Upper Briggs are dominated by previously managed stands (~71%). ACS objective 8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
Wilderness and inventoried roadless areas	Evaluation of the Wilderness Act and Roadless Area Conservation Rule is incorporated in its entirety within this section; there is no stand-alone specialist report. Based on a review of the project area (conducted using standards put forth in FSH 1909.12 Section 71.1[2] and using GIS to perform the analysis), there are no wilderness, potential wilderness, or inventoried roadless areas within the project area.

Best Management Practices/Mitigation Measures/Product Design Feature

Each activity under the proposed action would follow recommended measures to protect various resources within the analysis area. The following table lists mitigations measure specific to vegetation.

Table 3. Best management practices/mitigation measures/product design features

Consideration	Evaluation Conclusion
Insect infestation (Pine (*sp*) Bark Beatles)	Felled material is to be either removed, lopped and scattered and or piled and burned. Do not leave felled material to stay in treatment unit over one season
Fuel build up under trees to be retained	Remove fuel loadings to reduce fire effects on crown, root and bole scorch. Follow guidance in fuels report for fuels treatment types and application of fire.

Proposed Action and Alternatives

The following table lists the comparison of acres treated with the Upper Briggs Creek Watershed.

Table 4. Comparison of Alternatives 2 & 3. Primary Treatment Objective Acres for Upper Briggs Restoration Project, and Percent of Upper Briggs Creek Watershed Treated.

Primary Treatment Objective	Alternative 2 Acres Treated	Alternative 2 % Watershed	Alternative 3 Acres Treated	Alternative 3 % Watershed
DELSH	1053	4%	556	2%
Riparian Restoration*	183	<1%	128	<1%
Roadside FMZ	713	3%	794*	3%
Pine Oak	706	3%	479	2%
Rare Plants	42	<1%	42	<1%
Meadow Restoration	188	<1%	126	<1%
Ridgeline FMZ	1132	4%	503	2%
Total Acres	**4017**	**16%**	**2628**	**11%**

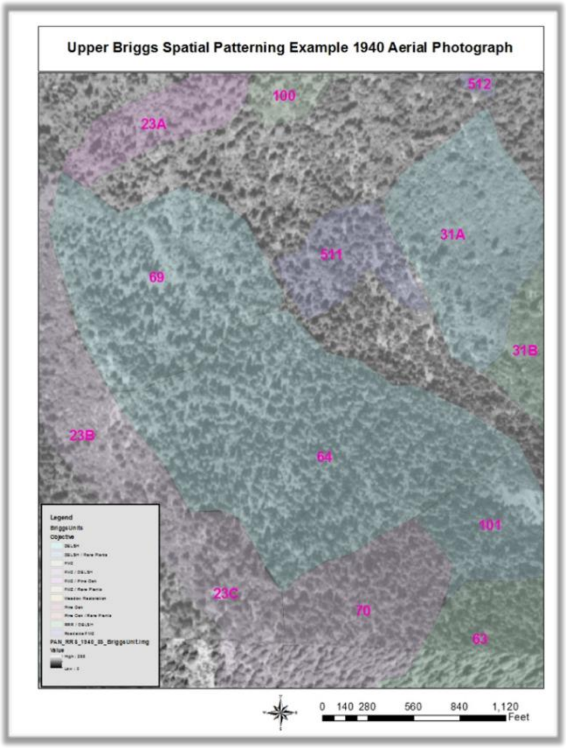
*Acres reflect units where the primary objective is riparian restoration. The proposed Riparian restoration will occur in units where the primary objective (DELSH, Roadside FMZ, Pine Oak, Rare Plants, etc.) occurs across the project area.

No Action

The no action alternative will have an effect on the existing vegetation by leaving the majority of area in a risk state for insect and disease, fire (both human and natural) and density related mortality. The stands that are displayed in the map that are in the very low soil moisture availability will continue to have individual and group tree mortality due to insect and disease, competition of limited resources and increased mortality due to un prescribed fire.

Proposed Action

As mentioned previously, approximately 71% of proposed treatment acres are within stands that have had various past timber harvest activities to include, clear cut, partial cut, salvage, shelterwood and seed tree cut. The remaining unmanaged stands lack structural complexity due to fire exclusion starting in 1906 (Metlen et. al. 2016). The resulting in-growth has simplified stand structure by filling in gaps in the canopy that were created through frequent fire. Aerial photography from the 1940's displays the earliest landscape representation of course texture associated with a mixture of fire severity and regimes. The contrast between current aerial photography and the 1940's displays the simplification of canopies to a low amount of open late serial stands and a large proportion of stands with two cohorts (legacy trees prior to 1906 and the subsequent ingrowth after fire exclusion).



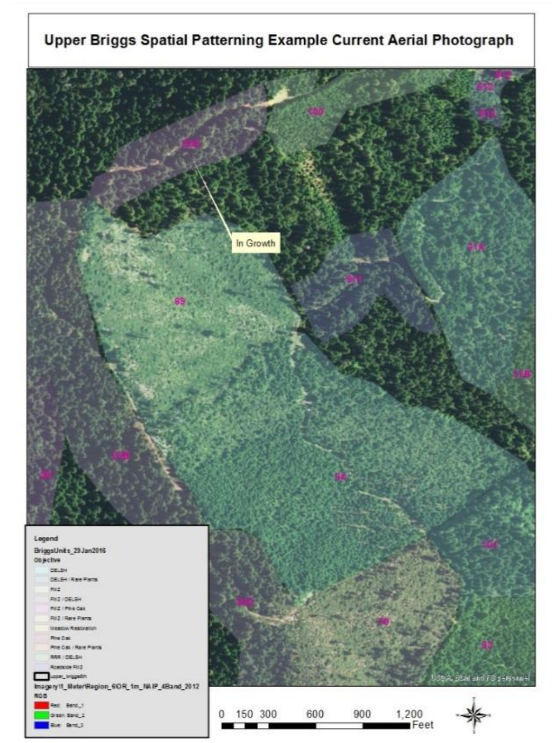


Image 14. Aerial Photograph examples of 1940 conditions verses current conditions.

Thinning treatments would focus on trees less than 120 years of age that would not have been exposed to frequent fires. The young (<120 year cohort) would have not have had the same growing conditions that their fire adapted cohorts had been exposed through their development. Frequent low severity fires to a mix severity fire regime dominated the landscape prior to 1906 (Churchill 2016). Proposed silvicultural prescriptions are tailored to meet the identified ecological need for each treatment unit (eg. conserve and enhance NSO habitat, retain and restore structural and species diversity, strategically manage fuels to reduce fire risk and reintroduce prescribed fire use to the landscape, etc). Each objective's prescription is described in more detail below.

Variable Density Management (Managed Stands and disturbance response less than 80 years old)

Variable density management is prescribed in stands less than 80 years of age (stands with previous management 71% of project area and ingrowth from fire scars), single canopied and low within-stand diversity. These stands currently lack functionality for late-successional related species and would continue in this condition without management intervention or a natural disturbance agent. Treatments would occur on both dry and moist habitat types.

Variable density management treatment units occur in NRF and dispersal habitat and all treatments would treat and maintain the habitat (with the exception of strategic ridgeline FMZs). Treatments would retain at least 40 percent canopy cover in dispersal habitat and at least 60 percent canopy cover and other habitat features in NRF habitat. Management scenarios would differ by plant association group, site conditions and harvest system. Stands that would maintain at least 60 percent canopy cover where helicopter yarding is proposed would see gap-only treatments ranging in size from 1/5 to 3/4 acre across 20% of the treatment area. Stands with conventional yarding that maintain at least 40 percent canopy cover in dispersal habitat would retain from 40-160 ft^2 BA/AC (40 ft^2 would occur in canyon live oak, and pine oak associations), while those that maintain at least 60 percent canopy cover in NRF would generally retain from 120-240 ft^2 BA/AC. Treatments would retain components of understory and intermediate trees for complex structural development. Thinning would be distributed across canopy layers and tree classes, create canopy gaps, and vary tree sizes and species. In some instances younger plantations or simplistic natural stands are proposed for heavy thinning (widely spaced residual trees) in order to maximize growing space for these young trees so they can grow into large dominant trees with large, complex crown structure. The primary rationale for this early, aggressive thinning is drawn from research on the development of old-growth forest stands in the Cascade and Siskiyou Mountains of southwestern Oregon, which indicates the old-growth stands of Southwestern Oregon were primarily developed by the interactions of low severity fires reducing tree densities allowing a few dominant trees to grow very large early in their lifespan, which in turn creates the foundation for future multi-aged, old-growth or late-seral stand conditions (Sensenig et al 2013). Because crown classes are defined and differentiated by light, stands with more sunlight penetration allow for more vertical distribution of leaf area. This in turn produces the most layering and the diverse structure desired in late successional forests.

Variable Density Management is primarily an intermediate thinning while retaining components of the stand, where available, that contributes to ecological diversity and stand variability. For example, a 65 year old plantation would generally be composed of Douglas-fir, and form an even-aged layer with little within stand species or structural diversity. Variability can be restored by utilizing microsite variations in land type and soil type. Examples of microsite variations include increasing the growing space for minor species, clumping groups of trees that provide vertical diversity in swales and draws, retaining clusters of trees around snags and down wood, reducing densities along swallow ridge tops, etc. Treatment outcomes would result in variable densities including gap openings from 1/5 to ¾ acre in size, equally sized untreated skip areas, and thinning regimes all of which would vary depending on the condition of the stand. Examples of untreated areas would occur around features such as preexisting concentrations of CWD, topographical swales unique to the stand, small wet areas (i.e. seeps or springs) and other features uncommon to the remaining stand. Conversely, equally sized heavier treated areas would occur as complete openings in the stand, hybrid openings to release any remnants of legacy trees centered within the opening, and natural openings credited toward gaps (see graphic below for an example of microsite variations within stands).

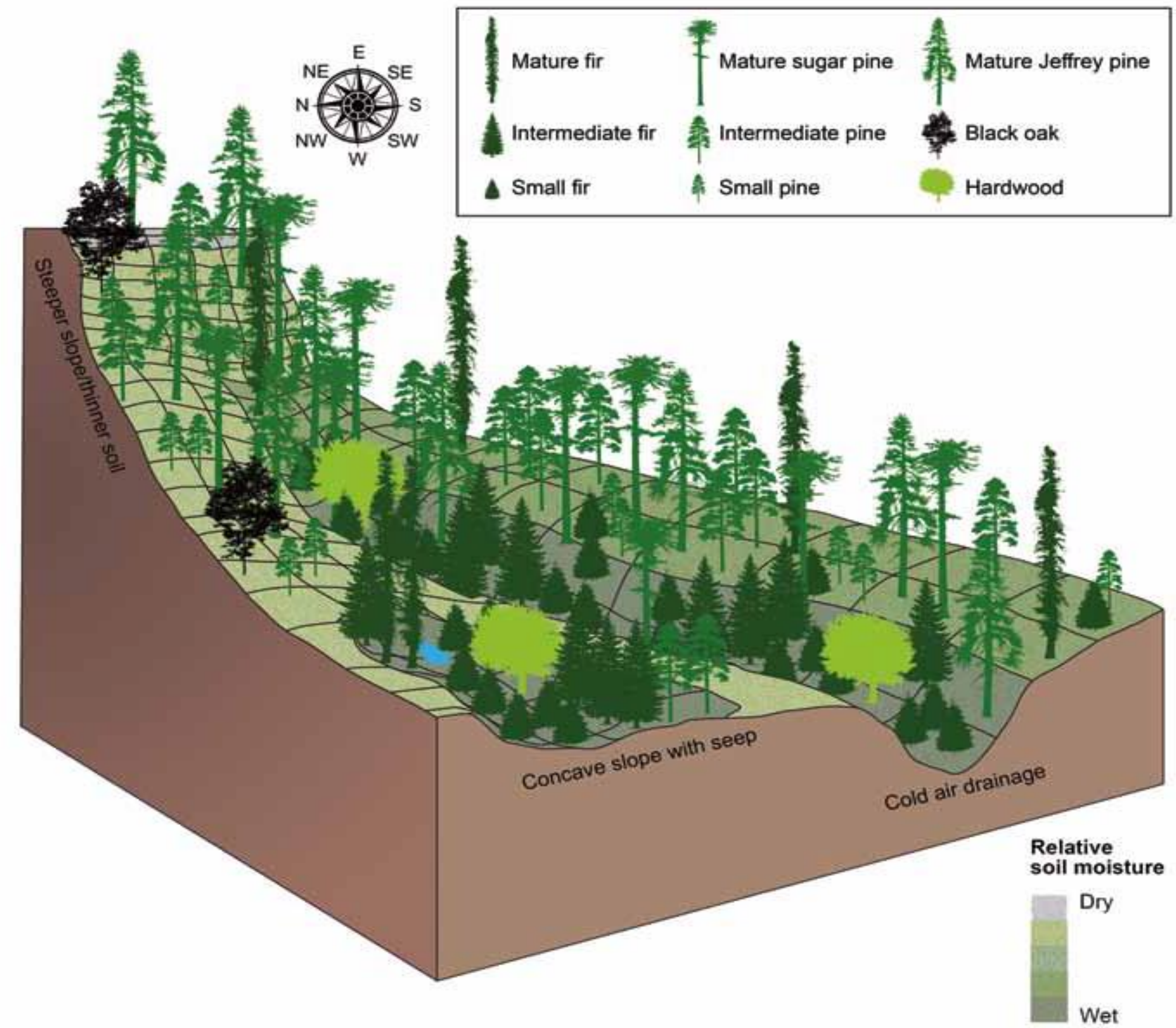


Figure 2. Example of microsite variations that occur within stands (North et al., 2009, GTR 220)

Some overstocked stands also contain larger trees that could benefit from a reduction of competing subordinates. In some cases, these subordinate trees are greater than 20" DBH due to high site productivity and are 80 years old or less. The condition to remove trees over 20 inches DBH would be to promote and cultivate a larger, adjacent (from within 10-15 feet) legacy tree. This treatment is designed primarily to retain large (>20 inch DBH) fire resilient trees (namely ponderosa pine, sugar pine, and Douglas-fir), reduce loss of species diversity, maintain vigor of the larger tree for optimum late-successional development, and modify the stocking level of the stand to reduce large-scale loss of existing late-successional structure. If harvesting these trees and entering older stands results in a negative short-term effect to late-successional forest-related species, this would be outweighed by the long-term benefits to such species.

Legacy Tree Culturing (Natural Stands DELSH)

Legacy tree culturing is proposed in both moist and dry forest conditions to maintain key ecological species on the landscape. This treatment is utilized to release legacy individual and clumps from fire suppression ingrowth. Clumps can be as small as two legacy trees with interlocking crowns and or bowls, or as large continuous clumps (see images below for examples of clump sizes).

Image 15. Individual legacy[2]

Figure xx. Small Clump[1]

[2] SW-OR ICO Workshop Presentation D. Churchill October 2016

Image 16. Medium Clump[1] Figure xx. Large clump[1]

The goals of the prescription to utilize existing legacy structure to dictate where gaps would occur on the landscape. Legacy tree thinning would vary according to species. Hardwood legacy individual and clumps would target opening to occur to the southern aspect for maximum light availability (90º to 270º see graphic below)

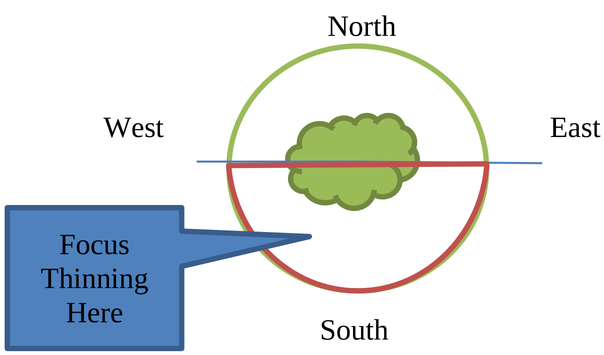


Figure 3. Hardwood thinning areas

Legacy tree culturing involves the reduction of competing trees around super dominant old growth Douglas-fir, ponderosa pine, oak, and incense cedar individuals and legacy groups. Cultivating these thick-barked fire resilient trees would contribute to their persistence on the landscape for maintaining or improving biological diversity. Radial and or dripline thinning around these legacy components would reduce the risk of high intensity fire within close proximity and would increase the chance of successful regeneration of their genetics. Openings would decrease competition for resources for legacy trees (York et al 2007). Openings around legacy trees may range in size from ¼ to ¾ acre and would provide potential conditions for regeneration in the larger openings. Subsequent inter-plantings of fire resilient and drought tolerant ponderosa pine, sugar pine and black oak may occur if natural regeneration fails due to lack of seed source. Areas were reforestation may occur would be where evidence of the species occurred prior to fire suppression (evidence would include snags and downed woody material i.e. California black oak). This regeneration would provide for their reestablishment and long-term persistence on the landscape. The prescription limits this treatment so that not all legacy trees in the project receive radial thinning including the following areas: riparian no treatment buffers, rare plant populations that do not require disturbance and or are light intolerant, logging systems that are not feasible or would cause a high amount of damage to legacy trees and red tree vole high priority habitat locations (see image below for an example of mitigation effects to spatial distribution of thinned and untinned stands).

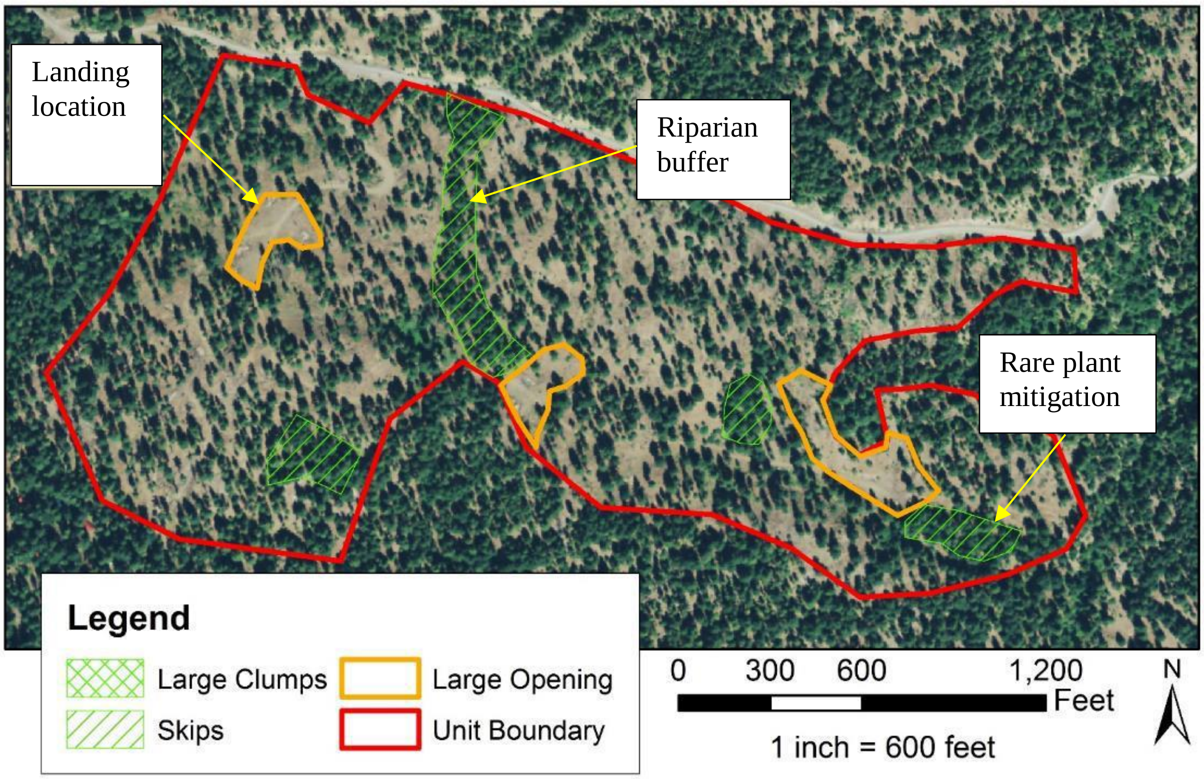


Image 17. Example of potential mitigation effects on spatial patterning[3].

Many of these legacy tree components would be left with intermediate sized trees to satisfy structural complexity objectives. An exception to this conditions would be where intermediate trees are exacerbating risks to legacy trees (i.e. Douglas-fir next to bowl of ponderosa pine blocking winds from dispersing pheromones from bark beetles) intermediate trees would be removed underneath the dripline of the legacy ponderosa pine. “Thistle et al. examined the near-field canopy dispersion of tracer gases, as a surrogate for bark beetle pheromones, within the trunk space of trees. They showed that when surface layers are stable (e.g., during low wind velocities) the tracer plume remained concentrated and showed directional consistency due to suppression of turbulent mixing. Low density stands result in unstable layers and multi-directional traces that dilute pheromone concentrations and could result in reductions in beetle aggregation. A significant number of pioneer beetles are required to overcome host defenses. A

[3] Map from ICO workshop Churchill presentation is used as graphical aid only.

lack of beetle recruitment often results in unsuccessful attacks." (Fettig et al 2007). Legacy tree culturing treatment units occur in NRF and dispersal habitat and all treatments would treat and maintain the habitat (not true in strategic ridgelines).

Restoration Thinning (Pine Oak)

This prescription involves habitat management in dry forest stand conditions. These stands contain higher levels of ponderosa pine, incense cedar and black or white oaks. Dry forests have been highly impacted from fire suppression resulting in significant in-growth of competing vegetation, primarily Douglas-fir. Basal areas would range from 40-180 ft^2 BA/AC (high degree of variation exist due to position on slope, higher BA would occur on toe slope or next to a riparian conversely lower BA would occur on ridge tops).

Fire and drought tolerant species (ponderosa pine, incense cedar canyon live, California black and Oregon white oaks) would be retained, cultured, and favored over Douglas-fir to improve biological diversity at the landscape scale, Treatments would retain components of understory and intermediate trees for complex structural development. Thinning would be distributed across canopy layers and tree classes, create canopy gaps, and vary tree sizes and species. The restoration thinning treatments would result in a mixture of treat and maintain or a downgrade of NRF habitat, or a treat and maintain of dispersal habitat. In the cases where this prescription would result in a downgrade of NRF habitat the treatment is proposed to emphasize ecological restoration (lower tree density and spacing similar to pre-fire suppression conditions) and is consistent with recommendations included in the "Restoring Dry Forest Ecosystems" section of the Revised Recovery Plan for the Northern Spotted Owl (USDI 2011, pgs III-32-38).

Image 18. Pacific Fisher resting on an oak.

Variable Density Thinning (Riparian Reserve)

Variable density thinning (VDT) is proposed in both managed stands and natural stands. These stands are primarily even-aged or two aged. Single storied plantations or even-aged as the result of fire disturbance. These stands are dominated by Douglas-fir. This treatment aims to enhance structural and species diversity, and result in a stand containing a variety of stand densities for development into late-successional conditions to meet Aquatic Conservation Strategies (USDA, USDI 1996). The desired variability and structural complexity from this treatment is explained under *Density Management*. Treatments would retain at least 60 percent canopy cover and other habitat features in both dispersal and NRF habitat. Management scenarios would differ by harvest system. Stands that would maintain at least 60 percent canopy cover where helicopter yarding is proposed would see gap-only treatments ranging in size from 1/5 to ¾ acre. Stands in upland riparian reserves would maintain at least 60 percent canopy cover in NRF and dispersal habitat. Treatments would retain components of understory and intermediate trees for complex structural development. Thinning would be distributed across canopy layers and tree classes, create canopy gaps, and vary in tree sizes and species.

In the cases where this prescription results in NRF downgrade or dispersal removal the treatment is proposed to emphasize ecological restoration (lower tree density and spacing closer to pre-fire suppression conditions) and is consistent with recommendations included in the “Restoring Dry Forest Ecosystems” section of the Revised Recovery Plan for the Northern Spotted Owl (USDI 2011, pgs III-32-38). The NRF downgrade is proposed in low priority owl sites as identified through the Recovery Action 10 priority process.

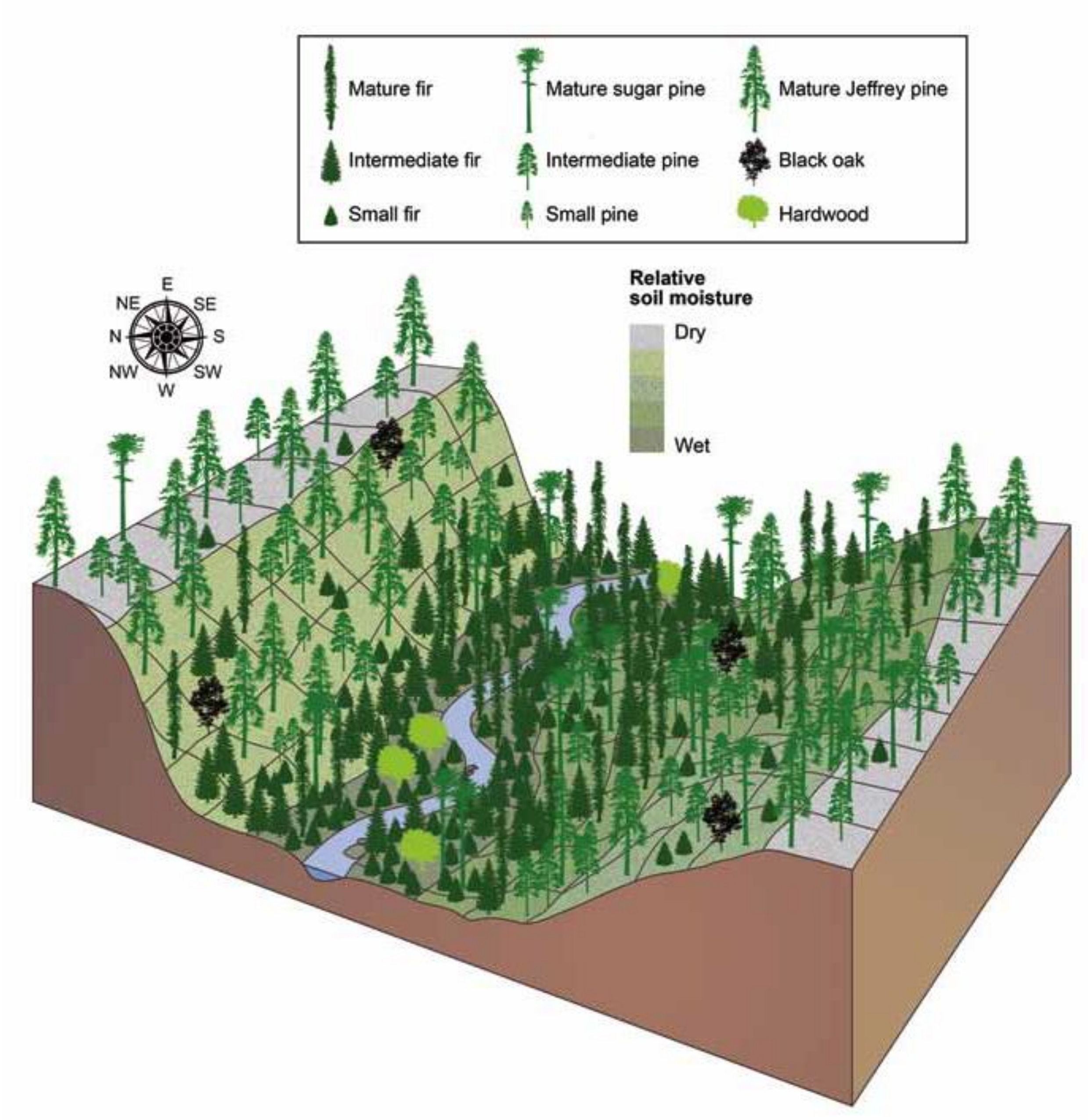


Figure 4. Example of microsite variability associated with riparian reserves (North et al., 2009, GTR 220)

Understory fuels Reduction (Roadside FMZ, FMZ)

Wildfire presents the greatest risk of late-successional habitat loss in this CHU (USDA USDI 1999) and was exemplified in the summers of 2002, 2009, 2011 and 2015 with the Biscuit, Oak Flat, Horse Mountain and Onion Mountain Fires along with various lightning strikes located along ridge tops (i.e. Rattlesnake springs southwest portion of the proposed ridge top Roadside

FMZ. An example of landscape fire scar patterning in the roadside FMZ is seen in the 1940 aerial photograph below.

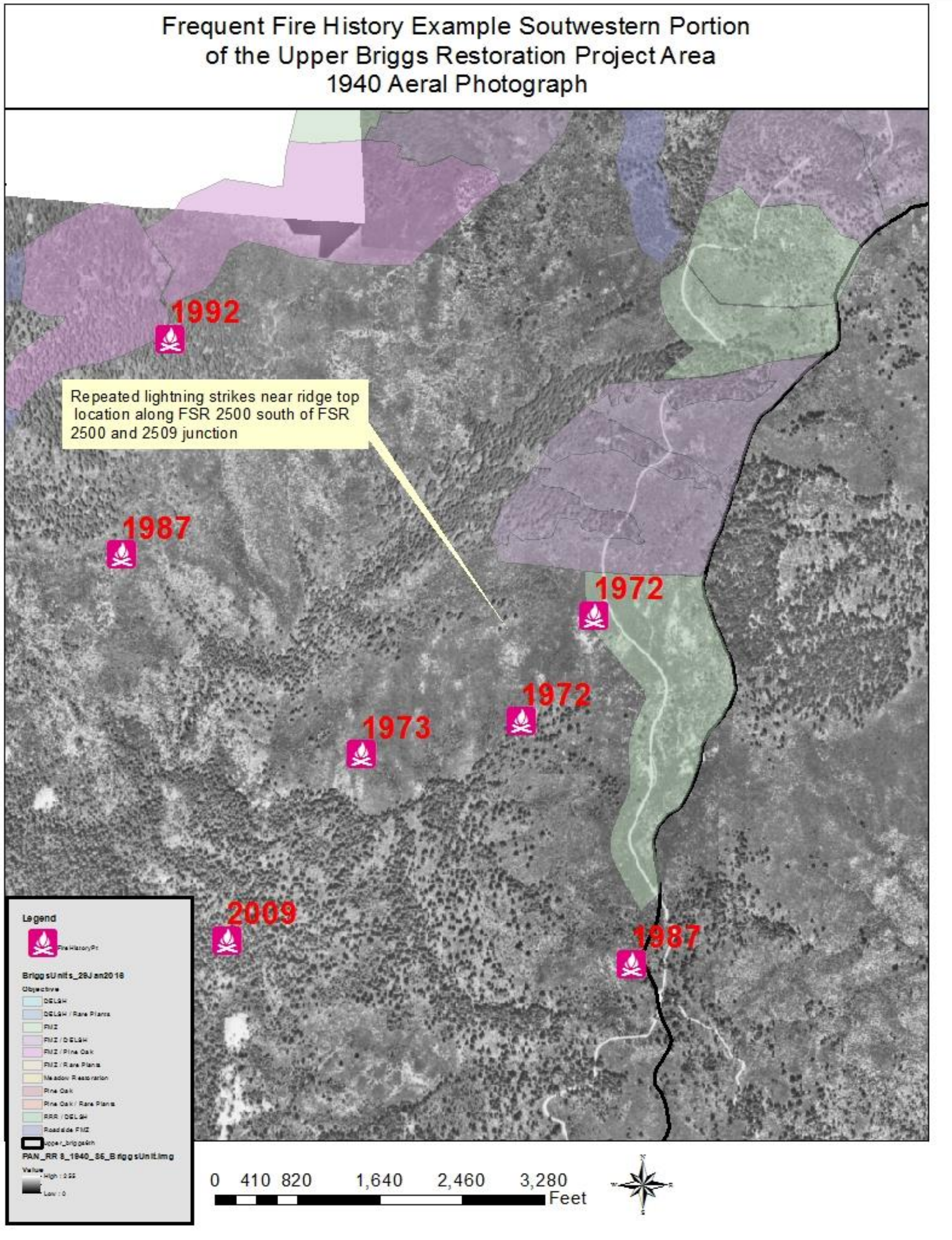


Image 19. Map of historical aerial photography displaying fire scars and historical fire point data within old fire scars.

Understory fuels treatments goals would be to remove ladder fuels under trees selected for retention to include legacy trees. Multiple prescribed fire treatments would be required to consume fuels from activity generated fuels (landing and unit piles) and understory burning treatment to consume surface fuels. This prescription is proposed in overly dense stands and the treatment is intended to restore the inherent forest structure and composition to reintegrate the relationship of vegetation to the disturbance regime. Treatments include thinning, slashing, hand-piling, pile-burning, chipping, lop and scattering, biomass removal, and/or under burning. Slashed material (<80 years of age) would be either pilled or scattered. Hardwood would be spaced to avoid creating ladders to overstory trees. Pruning would be used to lift the crown from the ground, where if pruning were not completed, overstory trees would be at risk for loss due to fire. Individual trees would left without pruning were fuel pull back or ignition would reduce the risk of loss by fire. Trees that have large lower limbs that provide roosting opportunities would be the best candidate to leave unpruned as long as the tree does not increase the risk of crown fire in adjacent trees. Landscape fire resiliency is an important goal of ecosystem restoration efforts to increase the likelihood that spotted owl habitat would persist on the landscape and develop as part of this fire adapted community instead of risking habitat loss and subsequent reduction in owl numbers. Understory fuels reduction treatments would occur in current NRF and dispersal habitat. NRF habitat would be downgraded to dispersal habitat in the strategic ridgelines. Legacy trees that comprise NRF habitat would be preserved (trees >120 years of age).

Meadow Restoration

Treatments in meadow systems would target encroaching conifers and decadent shrub (*Ceanothus integerrimus*) species for removal or re-sprout. Treatments may include cutting, pruning, pilling, sectioning, pile burn and broadcast burning. Legacy trees that are located within meadow systems would be maintained by pruning to prepare for burning activities (unless large lower limbs are present for roosting in these cases fuel pull back would occur to protect limbs. Once cutting and preparation work is complete, fire would be used to maintain meadow systems. Special attention would be place on timing of burning due to the potential of invasion of noxious weeds where sources already exist or could be transported. These areas have mapped NRF, however areas are small < 2.5 acres and would not serve as functional NRF areas

The proposed action would increase forest health in the measure of RDI for all stands. Some units would not receive as much thinning as required to move the stand conditions far enough to ensure that stands are in the range of 35% - 55% of max SDI with some stands ranging below 35% of maximum SDI (roadside FMZ and Strategic Ridgelines FMZs. This will cause some stands to still have increased risk to insect and disease and density related mortality. However thinning these stands decrease the risk from very high to high. Stand summaries are listed below with desired future conditions set for 5 years which will include commercial thinning, fuels thinning, punning, piling, pile burn and at least one under burn with a wildfire set at 2022.

Table 3. Comparison of proposed action activities. Ranges are highly variable due to multiple plant associations occurring with one planning unit. FMZs have the highest amount of variability due to the influence of ultramafic plant associations that occur along the roadside FMZ.

Objective	Acres	Year	BA*	QMD*	TPA*	RDI% of Max SDI Low*	RDI % of Max SDI High*
DELSH	1053	2022	26-374	1.6-26.7	41-551	.35	.76
Pine Oak Restoration	706	2022	40-289	1.6-18.8	20-200	.35	.77
Riparian Reserve	183	2022	49-467	1.6-24.2	13-957	.35	.67
Meadow Restoration	188	2022	0-320	0-17.4	0-720	0	.72
Rare Plant Restoration	42	2022	80-467	4.1-25.42	44-638	.23	.72
FMZ	1132	2022	20-392	1.4-23.4	13-610	.23	.72

*Includes the results of skips due to project design criteria

Alternative 3

Alternative 3 includes the same treatment objectives described alternative 2, however the total area treated (2,628 acres) would only treat units that are under 80 years in stand age and implements a 120 foot no-treatment buffer on streams. Existing roadbeds would be used for harvest and no new temporary roads would be constructed.

Variable Density Management (Managed Stands and disturbance response less than 80 years old)

Variable density management is prescribed in stands less than 80 years of age (stands with previous management 71% of project area and ingrowth from fire scars), single canopied and low within-stand diversity. These stands currently lack functionality for late-successional related species and would continue in this condition without management intervention or a natural disturbance agent. Treatments would occur on both dry and moist habitat types.

Variable density management treatment units occur in dispersal habitat only and all treatments would treat and maintain the habitat (with the exception of strategic ridgeline FMZ). Treatments would retain at least 40 percent canopy cover in dispersal habitat Management scenarios would differ by plant association group, site conditions and harvest system. Stands with conventional yarding that maintain at least 40 percent canopy cover in dispersal habitat would retain from 40-160 ft^2 BA/AC (40 ft^2 would occur in canyon live oak, and pine oak associations). Treatments would retain components of understory and intermediate trees for complex structural development. Thinning would be distributed across canopy layers and tree classes, create canopy gaps, and vary tree sizes and species. In some instances younger plantations or simplistic natural stands are proposed for heavy thinning (widely spaced residual trees) in order to maximize growing space for these young trees so they can grow into large dominant trees with large, complex crown structure. The primary rationale for this early, aggressive thinning is drawn from research on the development of old-growth forest stands in the Cascade and Siskiyou Mountains of southwestern Oregon, which indicates the old-growth stands of Southwestern Oregon were primarily developed by the interactions of low severity fires reducing tree densities allowing a few dominant trees to grow very large early in their lifespan, which in turn creates the foundation for future multi-aged, old-growth or late-seral stand conditions (Sensenig et al 2013). Because crown classes are defined and differentiated by light, stands with more sunlight penetration allow for more vertical distribution of leaf area. This in turn produces the most layering and the diverse structure desired in late successional forests.

Variable Density Management is primarily an intermediate thinning while retaining components of the stand, where available, that contributes to ecological diversity and stand variability. Variability can be restored by utilizing microsite variations in land type and soil type. Examples of microsite variations include increasing the growing space for minor species, clumping groups of trees that provide vertical diversity in swales and draws, retaining clusters of trees around snags and down wood, reducing densities along swallow ridge tops, etc. Treatment outcomes would result in variable densities including gap openings from 1/5 to ¾ acre in size, equally sized untreated skip areas, and thinning regimes all of which would vary depending on the condition of the stand. Examples of untreated areas would occur around features such as preexisting concentrations of CWD, topographical swales unique to the stand, small wet areas (i.e. seeps or springs) and other features uncommon to the remaining stand. Conversely, equally sized heavier treated areas would occur as complete openings in the stand, hybrid openings to release any remnants of legacy trees centered within the opening, and natural openings credited toward gaps (see graphic below for an example of microsite variations within stands).

Variable Density Thinning (Riparian Reserve)

Variable density thinning (VDT) is proposed in managed stands and stands initiated by fire that are less than 80 years old. These stands are primarily even-aged or two aged. Single storied plantations or even-aged as the result of fire disturbance. These stands are dominated by Douglas-fir. This treatment aims to enhance structural and species diversity, and result in a stand containing a variety of stand densities for development into late-successional conditions to meet Aquatic Conservation Strategies (USDA, USDI 1996). The desired variability and structural complexity from this treatment is explained under *Density Management*. Treatments would retain at least 60 percent canopy cover and other habitat features in dispersal habitat. Management scenarios would differ by harvest system. Stands that would maintain at least 60 percent canopy cover where helicopter yarding is proposed would see gap-only treatments ranging in size from 1/5 to ¾ acre. Stands in upland riparian reserves would maintain at least 60 percent canopy cover. Treatments would retain components of understory and intermediate trees for complex structural development. Thinning would be distributed across canopy layers and tree classes, create canopy gaps, and vary in tree sizes and species.

The variable density thinning prescription would treat and maintain 128 acres of dispersal-only habitat. This alternative would place a 120 foot buffer for no treatment of riparian reserves and treatment would only occur in managed stands or stands less than 80 years old.

Understory fuels Reduction (Roadside FMZ, FMZ)

Understory fuels treatments goals would be to remove ladder fuels under trees selected for retention to include legacy trees. Multiple prescribed fire treatments would be required to consume fuels from activity generated fuels (landing and unit piles) and understory burning treatment to consume surface fuels. This prescription is proposed in overly dense stands and the treatment is intended to restore the inherent forest structure and composition to reintegrate the relationship of vegetation to the disturbance regime. Treatments include thinning, slashing, hand-piling, pile-burning, chipping, lop and scattering, biomass removal, and/or under burning. Slashed material (<80 years of age) would be either pilled or scattered. Hardwood would be spaced to avoid creating ladders to overstory trees. Pruning would be used to lift the crown from the ground, where if pruning were not completed, overstory trees would be at risk for loss due to fire. Individual trees would left without pruning were fuel pull back or ignition would reduce the risk of loss by fire. Trees that have large lower limbs that provide roosting opportunities would be the best candidate to leave unpruned as long as the tree does not increase the risk of crown fire in adjacent trees. Landscape fire resiliency is an important goal of ecosystem restoration efforts to increase the likelihood that spotted owl habitat would persist on the landscape and develop as part of this fire adapted community instead of risking habitat loss and subsequent reduction in owl numbers. Understory fuels reduction treatments would occur in current NRF and dispersal habitat. NRF habitat would be downgraded to dispersal habitat in the strategic ridgelines. Legacy trees that comprise NRF habitat would be preserved (trees >80 years of age).

Meadow Restoration

Treatments in meadow systems would target encroaching conifers and decadent shrub (*Ceanothus integerrimus*) species for removal or re-sprout. Treatments may include cutting, pruning, pilling, sectioning, pile burn and broadcast burning. Legacy trees that are located within meadow systems would be maintained by pruning to prepare for burning activities (unless large lower limbs are present for roosting in these cases fuel pull back would occur to protect limbs. Once cutting and preparation work is complete, fire would be used to maintain meadow systems. Special attention would be place on timing of burning due to the potential of invasion of noxious weeds where sources already exist or could be transported. These areas have mapped NRF, however areas are small < 2.5 acres and would not serve as functional NRF areas

Summary

Alternative 3 would increase forest health in the measure of RDI for managed stands ≤80 years of age. The roadside FMZs would still occur however, these treatment would not treat anything ≥80 years of age. Some units would not receive as much thinning as required to move the stand conditions far enough to ensure that stands are in the range of 35% - 55% of max SDI. This will cause some stands to still have increased risk to insect and disease and density related mortality. However thinning these stands will decrease the short term risk (10 years). Activity summaries are listed below with desired future conditions in 5 years which will include commercial thinning, fuels thinning, punning, piling, pile burn and at least one under burn with a wildfire set at 2022 at 90th percentile weather conditions.

Table 4. Comparison of activities of alternative three. Ranges are highly variable due to multiple plant associations occurring with one planning unit. FMZs have the highest amount of variability due to the influence of ultramafic plant associations that occur along the roadside FMZ.

Objective	Acres	Year	BA*	QMD*	TPA*	RDI% of Max SDI Low*
DELSH**	556	2022	26-374	1.6-26.7	41-551	.35
Pine Oak Restoration	479	2022	40-289	1.6-18.8	20-200	.35
Riparian Reserve	128	2022	49-467	1.6-24.2	13-957	.35
Meadow Restoration	126	2022	0-320	0-17.4	0-720	0
Rare Plant Restoration	42	2022	80-467	4.1-25.42	44-638	.23
FMZ	473	2022	20-392	1.4-23.4	13-610	.23

*Includes the results of skips due to project design criteria
**Represents stands that are previously managed or are the result of a fire scare ≤80 years of age

Actions common to the proposed action and alternative 3

Both alternatives would thin the ~71% of stands less than or equal to 80 years of age. Stands would receive fuels treatments and would have the required under burning to help reduce future maintenance of vegetation. Road work proposed is independent of vegetation treatments. Any road decommissioning or storage that is proposed would be scheduled after implementation of vegetation treatments and fuels work are completed. For a detailed report on the effects of road decommissioning, storage and maintenance on Port-Orford-cedar please review the Port-Orford-cedar report.

Connected action

Connected actions to the alternative includes road work proposed is independent of vegetation treatments. Any road decommissioning or storage that is proposed would be scheduled after implementation of vegetation treatments and fuels work are completed. For a detailed report on the effects of road decommissioning, storage and maintenance on Port-Orford-cedar please review the Port-Orford-cedar report. Forest products such as firewood, post and poles would also be connected and be associated with landing piles and wood adjacent to roads that are in excess to downed woody guidelines for the area of harvest.

ENVIRONMENTAL CONSEQUENCES

ALTERNATIVE 1, NO ACTION

Immature Forest

- ***Landscape-Scale & Stand-Scale Effects***
- *Direct & Indirect*

There would be no direct or indirect effects on this cover type. The immature cover type would be faced with the same disturbance risks (competition, fire, insect and disease)

- *Cumulative*

Thinning and hazardous fuels reduction prescribed in *Plantation Thinning and Hazardous Fuels Reduction EA (2002)* would treat stands in this cover type, if implemented.

Intermediate Forest

- ***Landscape-Scale & Stand-Scale Effects***
- *Direct & Indirect*

There would be no direct effects. Over time this cover type would be at a higher risk of flat head fir borer activity and other insects and disease, especially in soils with low water holding capacity. Tree height to diameter ratios would increase, leading to higher risk of snow and or wind breakage. High tree densities would cause subdominant trees to die due to competition for resources. The canopy would continue to remain in a single story.

Change in stand structure would occur where insect or disease agents cause localized mortality. This would create a hole in the canopy layer and allow light to the forest floor. This light would be limited in scope as surrounding vegetation would actively compete for resources and grow towards the light. Large disturbance (i.e. fire) could also reset the stand to the immature forest type. Stand is this type would grow into mature/late forest beyond the analysis timeframe of this document.

- *Cumulative*

If implemented, the thinning and hazardous fuels reduction prescribed in the 2002 *Plantation Thinning and Hazardous Fuels Reduction EA* would treat this cover type where stands have a diameter less than 20” DBH. However, stands in this cover type are generally greater than 20” DBH, therefore the effect of such treatment at the landscape- and stand-scale would be minimal.

Mature/Late Forest

- ***Landscape-Scale & Stand-Scale Effects***
- *Direct & Indirect*

There would be no direct effects. Over time, as fuels continue to accumulate, stands in this cover type would be at increased risk for stand-replacing fires and insect outbreaks. Fire suppression efforts would continue to effect the cover type (see fuels section for more information)

- *Cumulative*

The cumulative effects would include fire and fire suppression impacts to this cover type. (See fuels section for more information). No other activities are planned to treat this cover type.

Open

- ***Landscape-Scale & Stand-Scale Effects***
- *Direct & Indirect*

There would be no direct effects. Over time trees will continue to encroach on meadow systems, thereby reducing the availability of resources needed for shade intolerant plants.

- *Cumulative*

The 2002 *Meadow Enhancement CE*, does not treat trees greater than 8" DBH, therefore, these trees will continue to grow and further reduce availability to resources needed for shade intolerant plants.

EFFECTS COMMON TO ALTERNATIVE 2 (PROPOSED ACTION) & ALTERNATIVE 3 (REDUCED TREATMENT)

The following table compares the vegetation treatment acres for Alternative 2, Proposed Action and Alternative 3, Reduced Treatment.

Table 1. Comparison of Alternative 2 & 3. Primary Treatment Objective Acres for Upper Briggs Restoration Project and Percent of Upper Briggs Creek Watershed Treated.

Primary Treatment Objective	Alt. 2 Acres Treated	Alt 2 % Watershed	Alt. 3 Acres Treated	Alt 3 % Watershed
DELSH	1053	4%	556	2%
Riparian Restoration	183	<1%	128	<1%
Roadside FMZ	713	3%	794	3%
Pine Oak	706	3%	479	2%
Rare Plants	42	<1%	42	<1%
Meadow Restoration	188	<1%	126	<1%
Ridgeline FMZ	1132	4%	503	2%
Total Acres	**4017**	**16%**	**2628**	**11%**

Immature Forest

- ***Landscape-Scale Effects***
- *Direct*

The direct effects to the Immature Forest type will occur in stands with Meadow restoration objectives. The stands have encroached into the meadow systems and would be classified as an Immature Forest type and are displayed as acres treated in Table 1. These acres after treated will no longer qualify as an Immature Forest type. These acres will provide increase in grass and forb production and offer opportunities for grazing (see wildlife report for more information).

- *Indirect*

This cover type will see an increase in vegetation response to thinning and burning. Stands with the FMZ treatments will also see the higher amount of grass and forb production due to the lower canopy cover than stands with objectives to maintain 60% canopy cover. Treated meadow systems will see an increase in grass and forb production; this will have the indirect effect of providing light flashy fuels to maintain low intensity under burning for stands in the FMZ objective.

- *Cumulative*

The immature forest will continue to receive treatment in the *Plantation Thinning and Hazardous Fuels Reduction EA* (2002). These cover types will be part of fuels reduction projects associated with some of the units are adjacent treatment units of the proposed Upper Briggs project. The cover types will receive thinning piling and burning.

- ***Stand-Scale Effects***
- *Direct & Indirect*

Treated stands would receive vegetation and/or fuels treatment. After the disturbance, vegetation would take advantage of recent openings and seed or re-sprout. This would have a beneficial effect of increasing the diversity of vegetation and accelerating the development of later seral forest structure. Management of fuel loading would have the beneficial effect of reducing the potential for large stand-replacing fires.

- *Cumulative*

If implemented, the thinning and hazardous fuels reduction described in the 2002 *Plantation Thinning and Hazardous Fuels Reduction EA* would treat stands in this cover type. Additional management of fuel loading would further reduce the potential for large stand-replacing fires.

Intermediate Forest

- ***Landscape-Scale Effects***
- *Direct & Indirect*

Approximately 70% of the stands in the proposed action include this cover type. The treatments proposed would accelerate growth by opening growing space and reducing competition for resources. This would have a beneficial effect of increasing the diversity of vegetation, reducing the risk of insect and disease issues, and accelerating the development of late seral forest structure.

Mid-seral stands exist on approximately 27% of the watershed. This is well above the historic range of 10% -15% for mid-seral stands in this watershed. The proposed treatments would favor the development of the desired mature / late seral cover type, thereby reducing the percentage of mid-seral cover type in the watershed to 15%.

This would have a beneficial effect of increasing the diversity of vegetation and accelerating the development of later seral forest structure Indirect effects to stands in this cover type include a reduction of risk of insect and disease issues as described in the existing environment section.

- *Cumulative*

When considering past and foreseeable future activities, the proportion of mature/ late seral forest would remain relatively stable and would begin to increase over the next 40 years as old fires and clearcuts develop back into mature/late seral forest structure. Stands with a Fuel management zones objective would maintain these stands in a late open seral type. This would reduce the risk of wildfire to other nearby stands.

- ***Stand-Scale Effects***
- <u>*Direct*</u>

Thinning would reduce tree density and create more open stands in order to accelerate individual tree growth. This seral stage would be maintained or advanced over time. In 40 years the stands in the DELSH objectives would develop into mature and late seral forests with two or more canopy layers and higher densities of large trees in the overstory. Ponderosa pine would be more prominent, but Douglas-fir would still dominate much of the stands composition.

- <u>*Indirect*</u>

Thinnings would produce a short-term increase in grass/forb/shrubs that decrease over time, as tree crowns close in the units with the DELSH objective. The indirect effects would be the gradual canopy closure that would occur 5–7 years post treatment. Some these effects would be epicormic branching, increase in diameter growth over the stand and increased individual tree vigor. These stands would also have an establishment of understory between under burn cycles. Stands that are proposed to meet FMZ objectives will also have the direct effect of thinning to meet fuels management objectives. These stands will be more open grown to provide for these objectives. These stands will see the most overstory growth through low densities than stands in other objectives. Stands in with the FMZ objectives will also see the higher amount of grass and forb production due to the reduced canopy cover. Stands that receive FMZ treatments will have a higher percentage of fire resistant pine and hardwoods.

- <u>*Cumulative*</u>

The cumulative effects for the intermediate stand type would be a movement into a mature / late seral stand structure. The stands would develop a second canopy layer and see an increase of standing snags and coarse wood development. Stands in this cover type will vary by objective of the proposed action. Stands that fall within FMZ objectives will continue to be managed through fire. These stands will continue to support light fuels to include grasses and forbs.

In addition, the Forest Service has another approved NEPA decision called *Plantation Thinning and Hazardous Fuel Reduction* (2002). This project has no current funding to implement and it is anticipated that such funding will not be available in near future. Within the Briggs Watershed, there are 7,461 acres of such thinning treatment that could be implemented.

Mature/Late Forest

- ***Landscape-Scale Effects***
- <u>*Direct*</u>

The mature/late seral forest cover type is currently 18% of the watershed. Alternative 2 would move the stands in this cover type on a trajectory towards the mature/late seral faster than Alternative 1, and would treat more acreage than Alternative 3.

- <u>*Indirect*</u>

The mature/late seral cover type would be less susceptible to insect and disease influences, fire and density related mortality. This would be due to fuels clean up in FMZ locations and under-burning to reduce fuel loadings (see fuels report). Units treated in this cover type would be in a late open condition in the pine oak restoration.

- *Cumulative*

The cumulative effects of the mature/ late seral forest type would include an increase of this cover type across the landscape. The reduction of closed late seral to open late seral would be seen in the FMZ on strategic ridgelines. The mature/late seral would see increases from the treatments of the intermediate cover type growing into the mature/late seral cover type. Under Alternative 2 this increase of cover type would be 30%. This would occur faster than Alternative 1, and more acreage would be treated than Alternative 3 (see table 58 for acreage comparison of alternatives).

- ***Stand-Scale Effects***
- *Direct*

At the stand scale the mature/late seral structure will be impacted by fuels treatments that occur in roadside and strategic ridgelines. However, many of the stands had a more open canopy structure in the past (prior to fire suppression) in the high elevation ridgelines. The simplification of these canopies was the result of fire suppression that led to the ingrowth of species not adapted to the fire regime. This simplification that currently shape these stands in both species composition and vertical canopy structure would be modified to higher species and canopy diversity. More acreage would be treated in the proposed alternative than alternative 3 (see table 58 for comparison of acreage changes per alternative).

Unit 42 is an example of one of these stands and vegetation effects can be seen in table 60. The proposed action would focus on the ingrowth that has resulted in excess trees and fuels (see fuels report for more information).

- *Indirect*

The indirect effects on stands in this cover type will be an increase in overall forest health due to reduction of density in these stands. Table 2 displays modeling data that shows an increase of the mean diameter of trees, and a reduction of stand density in a representative stand. This reduction is due to the removal of smaller trees and a focus to leave larger trees with fire adapted characteristics through the FMZ treatments.

- *Cumulative*

The cumulative effects of treated stands in this class would be a decrease in risk of loss due to the proposed action treatments. Under the proposed action more stands in this cover type would treated than alternative 3.

The pine/oak stands that occur in this cover type would see an acreage reduction due to the overall stand age exceeding 80 years. Pine/oak stands have seen an increase of understory competition through fire exclusion would be at higher risk to disturbance agents if left untreated (fire, insect and disease, etc.).

Open

- ***Landscape-Scale Effects***
- *Direct*

The open cover type would have an increase in acreage as a result of the proposed action. This effect would be immediate as trees and slash that are encroaching into the meadow systems are removed. This would increase sunlight to the ground for an increase of grasses and forb production. The surrounding vegetation would be thinned to feather densities approaching the meadow system to also allow light to reach the ground from the transition zone from meadow systems to forest woodlands. This increase in acreage would not increase the open cover type more than 1% across the scale of the watershed.

- *Indirect*

The open cover type would receive frequent broadcast burning (3-7 years). Any conifer encroachment would be minimized through this activity.

- *Cumulative*

The open cover type would continue to receive fuel treatments to maintain the meadow systems and keep the meadow systems in an early seral state. The continued maintenance would manage the encroachment of conifers.

- ***Stand-Scale Effects***
- *Direct*

The direct effects on the open stands structure would only apply to meadows systems where the proposed action is to remove encroaching conifers. These stands would remain in an open condition due to broadcast burns.

- *Indirect*

The indirect effects would be increased grass and forb production due to the lack of conifers competing for light resources in the meadow treatment areas.

- *Cumulative*

Stands would continue to receive fuel treatments to maintain the meadow systems and keep the meadow systems in an early seral state. The continued maintenance would manage the encroachment of conifers.

The *Meadow Restoration CE 2007* would not be a cumulative effect because the document discusses removal of trees less than 8” DBH.

COMPARISON OF ALTERNATIVES USING FOREST VEGETATION SIMULATOR (FVS)

The Forest Vegetation Simulator (FVS) is a family of forest growth simulation models that simulate a wide range of silvicultural treatments for most major forest tree species, forest types, and stand conditions. FVS answers questions about how forest vegetation will change in response to natural succession, disturbances, and proposed management actions. For more information about FVS, visit https://www.fs.fed.us/fvs/whatis/index.shtml.

Comparison of Effects on Representative Treatment Units

Stand-level data was used to model the vegetation effects of treatment in representative units; the results are shown in **Table 2**. Effects measured were: trees per acre (TPA), quadratic mean diameter (QMD), basal are (BA), stand density index (SDI), and relative density index (RDI). The stands selected for modeling represent the average across different vegetation types within the unit. For unit locations see **Error! Reference source not found.** and **Error! Reference source not found.**.

Table 2. Comparison of Effects on Representative Treatment Units.

	Alternative 1 No Action					**Alternative 2 Proposed Action**					**Alternative 3 Reduced Treatment**				
	UNIT 2: Develop & Enhance Late Seral Habitat (DELSH)														
Year	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**
2017	249	16.9	311	486	.44	249	16.9	311	486	.44	247	16.9	311	486	.44
2022	248	17.3	325	502	.45	136	22.5	254	366	.33	243	17.4	321	495	.45
2057	234	17.8	409	596	.54	52	32.2	290	336	.31	201	18.6	377	543	.49
	UNIT 3: Restore Pine-Oak Communities														
Year	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**
2017	1150	9.6	399	801	.98*	1150	9.6	399	801	.98*	1150	9.6	399	801	.98*
2022	1060	10	404	796	.98	399	9.7	158	309	.38	447	10.3	208	393	.48
2057	567	11.7	430	739	.91	88	18.9	159	230	.28	75	22.9	217	286	.35
	UNIT 48: Restore Meadow Systems														
Year	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**
2017	198	6.4	307	590	.72	198	6.4	307	590	.72	198	6.4	307	590	.72
2022	187	6.8	312	588	.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2057	172	9.9	369	590	.72	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	UNIT 63: Restore Riparian Reserves														
Year	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**
2017	232	9.6	176	311	.38	232	9.6	176	311	.38	232	9.6	176	311	.38
2022	231	10.4	205	351	.43	88	11.0	84	141	.17	179	13.4	177	289	.35
2057	258	14.3	367	559	.68	57	21.9	151	202	.25	112	21.2	275	375	.46
	UNIT 42: Create & Maintain Strategically Located Fuel Management Zones (FMZ)														
Year	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**	**TPA**	**QMD**	**BA**	**SDI**	**RDI**
2017	556	9.8	221	431	.53	556	9.8	221	431	.53	556	9.8	221	431	.53
2022	544	10.4	243	463	.57	109	13.4	97	162	.20	109	13.4	97	162	.20
2057**	412	12.7	364	607	.74	47	23.4	140	184	.23	47	23.4	140	184	.23

*Maximum SDI computed at 815 for the site in the model. The current stand data is above the threshold of maximum density. These areas will have a high risk of mortality.

**The stand used in this example does not display differences between alternative 2 and 3, however stands in alternative 3 would not have the same treatment due to trees >80 years of age will not be removed.

Comparison of Effects on Tree Structure in Riparian Treatment Units

Additional modeling was conducted on data from all riparian treatment units. The results of this modeling are shown in **Table 3**.

Table 3. Comparison of Effects on Tree Structure in Riparian Treatment Units.

	Trees Per Acre (>8" DBH)			Tree Height (ft.)			Mean Diameter (QMD*) (in.)		
	Alt. 1 No Action	Alt .2 Proposed Action	Alt. 3 Reduced Treatment	Alt. 1 No Action	Alt .2 Proposed Action	Alt. 3 Reduced Treatment	Alt. 1 No Action	Alt .2 Proposed Action	Alt. 3 Reduced Treatment
2017	130.5	130.5	130.5	107.8	107.8	107.8	7.8	7.8	7.8
2022	134.9	109.6	120.3	110.5	107.0	110.2	8.4	9.1	9.0
2057	133.4	110.7	124.0	141.0	136.7	139.3	11.8	15.0	13.8

**Quadratic Mean Diameter (QMD) is the measure of the mean weighted towards the larger diameter trees.*

Alternative 1, No Treatment: Riparian units would retain more trees per acre and those trees would be smaller in diameter in comparison to the other treatment alternatives. As time progressed there would be fewer trees in the understory due to shading; and trees would be very tall in comparison to their diameter, increasing the risk for stand collapse from breakage due to snow and wind events.

Alternative 2, Proposed Action: Riparian units would have fewer trees per acre than the other alternatives.

Alternative 3, Reduced Treatment: Alternative 3 would leave a larger buffer of untreated areas in riparian units in comparison to Alternative 2. As a result, riparian treatment units would have more trees per acre and those trees would be smaller in diameter in comparison to Alternative 2. As time progressed in the buffer zone, there would be fewer trees in the understory due to shading; and trees would be very tall in comparison to their diameter, increasing the risk for stand collapse from breakage due to snow and wind events.

References

Avery, Thomas & Burkhart, Harold. 2002. Forest Measurements 5th edition.

Beaufait, W., P.P. Laird, M. Newton, D.M. Smith, C.H. Tubbs, C.A. Wellner and H.L. Williston. 1984. Silviculture. *In:* Forestry handbook, second edition. Wenger, K.F., ed., Society of American Foresters. John Wiley and Sons, Inc. New York, NY. 1335 pp.

Churchill, Derick J et all. 2012. Restoring forest resilience: From reference spatial patterns to silvicultural prescriptions and monitoring. Forest Ecology and Management. 291 (2013) 442–457

Fettig, Christopher J. et al. 2007. The effectiveness of vegetation management practices for prevention and control of bark beetle infestations in coniferous forests of the western and southern United States. Forest Ecology and Management. 238 (2006) 24-53.

Metlen, Kerry, 2016 Rogue Basin Local Forest References. Stand Spatial Patterning and Age Cohorts in Forest Restoration and Management. Presentation. Rogue River Siskiyou National Forest, Medford Inter Agency Office, Medford Oregon.

North et. al. 2009. An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests. Pacific Southwest Research Station, PSW-GTR-220.

Oliver, C.D., Larson B. C. 1996. Forest Stand Dynamics. John Wiley and Sons, Inc. New York, NY. 533 pp. 544.

Reineke, L.H. 1933. Perfecting a stand-density index for even-aged forest. "Journal of Agricultural Research" 46:627-638

Sensenig, Thomas et al 2013 Stand development, fire and growth of old-growth and young forests in southwestern Oregon, USA Forest Ecology and Management. 291 (96-109).

United States Department of Agriculture, Forest Service. 1989*b*. Siskiyou National Forest Land and Resource Management Plan. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5315175.pdf

United States Department of Agriculture, Forest Service, and United States Department of the Interior, Bureau of Land Management. 1994*b*. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. USDA Forest Service, Pacific Northwest Region, Portland, Oregon. Available online at: http://www.reo.gov/library/reports/newroda.pdf

United States Department of Agriculture, Forest Service. 1995. Upper Briggs Creek Watershed Analysis. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316118.pdf

United States Department of Agriculture, Forest Service. 2015. Inland California Southern Cascades Variant. USDA Forest Service, Forest Management Service Center, Fort Collins, CO. Available online at: https://www.fs.fed.us/fmsc/ftp/fvs/docs/overviews/FVSca_Overview.pdf

York, Robert A et all. 2007. Gap-Based Silviculture in Sierran Mixed-Conifer Forest: Effects of Gap size on Early Survival and 7-year Seedling Growth. Pacific Southwest Research Station, PSW-GTR-203.

Appendix A – Port-Orford-Cedar Analysis

Upper Briggs Restoration Project

Wild Rivers Ranger District, Rogue River-Siskiyou National Forest

/s/ Robert Barnhart **Date: January 12, 2018**

Robert Barnhart, Certified Silviculturist

Introduction

This report conducts an analysis of the of the Upper Briggs Restoration project in relation to the Port-Orford-cedar that exists within the Upper Briggs Creek 6th field watershed. The Upper Briggs Creek 6th field watershed was used for the boundary of the project and this analysis utilized the boundary as limit for the analysis.

Port-Orford-cedar is a unique conifer growing only in Southwestern Oregon and Northwestern California. For a variety of reasons, including its ability to tolerate ultramafic (serpentine) soils and live along streams and other wet sites, it plays a significant ecological role in some forest communities. POC also supplies unique forest products, including wooden arrow stock, wood for Japanese soaking tubs and temples, aromatic storage boxes for American Indian ceremonial materials, and long-lasting cedar boughs. In 1952 and exotic root disease was identified killing the cedar near Coos Bay. Since that time the disease has spread across much of its range, killing POC and threating to reduce its ecological function and product availability.

This analysis will follow process established by *ROD FEIS Management of Port-Orford-Cedar in Southwest Oregon May 2004* for identifying a project's risk of spread of *Phytopthora lateralis* (P. lateralis) and provide management strategies for reducing risk of P. laterailis spread in the analysis area. Recommended management techniques for mitigation of the risk of spread will be identified for consideration by the approving official.

Background and Affected Environment

Background

Port-Orford-cedar (*Chamaecyparis lawsoniana*) is native to a limited area along the Pacific Coast. On the Rogue River – Siskiyou National Forest, updated inventory data shows Port-Orford-cedar (POC) occurs on approximately 133,000 acres on the Gold Beach, Powers, and Wild Rivers Ranger Districts. About 12,700 acres (8.7%) are infested with *Phytophthora lateralis*, the pathogen that causes POC root disease.

Port-Orford-cedar program objectives are to maintain POC as an ecologically and economically significant species on National Forest (NF) lands. The objective is to provide cost-effective mitigation for controllable activities creating appreciable additional risk to important uninfected POC, not to reduce all risk to all trees at all cost **Invalid source specified.**. Management slows the spread of the non-native pathogen *Phytophthora lateralis* (PL) enough to maintain POC's significant ecological and economic functions, without the cost of the management strategy exceeding its effects on the value of these functions.

Measurably Contributing (MC) Port-Orford-cedar: For the Wild Rivers Ranger District, POC canopy cover of **six percent or greater** is the threshold for POC that measurably contributes to meeting management objectives.

Phytophthora lateralis (PL) is spread via water or soil. A typical spread scenario involves infested soil being transported into an uninfested area on a vehicle or piece of equipment or, potentially, in infested water being transported in the tanks of fire engines or helicopter buckets during fire suppression activities. The infested soil falls off of the vehicle or spores are delivered via water and the pathogen first infects POC near the site of introduction. New spores from that infection are then washed downhill in surface water infecting additional hosts. This is especially lethal along drainages and creeks where infested water is channeled and flows near concentrations of healthy POC.

Factors Affecting Pathogen Spread - The following factors influence PL spread and establishment: Character of site, type of carrier, time of year of transport event, and distance traveled and associated time elapsed.

Factors Affecting Risk of Infection - Jules et al. (2002) showed that the incidence of new POC infection was positively associated with: 1) distance to the nearest POC, 2) host abundance, and 3) catchment area.

Risk Regions - The range of POC is divided up into three main risk regions. The Wild Rivers Ranger District is in the Siskiyou Risk Region (with 20 percent high risk sites) **Invalid source specified.**.

High risk sites are defined as streamside POC within 100 feet of a road and non-streamside POC within 50 feet of a road.

Low-risk sites are defined as streamside POC greater than 100 feet from a road and non-streamside POC greater than 50 feet from a road.

Uninfested 7th field watersheds are watersheds with greater than 50 percent Federal ownership and with greater than 100 Federal acres in stands that include POC, where at least the Federal lands are uninfested or essentially uninfested with PL. A map of all uninfested seventh field watersheds identified in the POC FSEIS is at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316274.pdf

The Port-Orford-cedar Risk Key is used to clarify the environmental conditions that require implementation of one or more of the disease controlling management practices listed in the Record of Decision (ROD) and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon Siskiyou National Forest**Invalid source specified.**. Application of the risk key and application of resultant management practices makes this project consistent with the mid- and large-geographic and temporal-scale effects described by the POC FSEIS analysis, and permits the analysis to tier to the discussion of those effects **Invalid source specified.**.

Mitigation - The objective of the risk key is to identify project areas/situations where new infections should be avoided, and guide the application of one or more of the management practices until the risk is acceptably mitigated. The risk key describes circumstances under which the various risk reducing management practices will be applied where needed. The POC ROD, Reference 2**Invalid source specified.** describes in detail the probability of spread/establishment of PL by various factors and the effectiveness of various management techniques to prevent that spread. Relative probabilities were determined for each factor from between 1 (very low) to 10 (very high). The probabilities of an event having the result under consideration were then expressed in percent for each number (1=0 to 2 percent to 10=50.1 to 100 percent).

Effects Mechanisms and Analysis Framework

Affected Environment – Port-Orford-cedar

Map – Figure one is located at the *end of this appendix*. It shows where project activities intersect known measurably contributing Port-Orford-cedar and *P. lateralis* infestations.

Wild Rivers Ranger District Many of the Port-Orford-cedar (POC) within the Wild Rivers Ranger District range in age from 200 to 400 years and are 20 to 60 inches in diameter. POC root disease has been present along the Oregon side of the Grayback Road going toward Happy Camp, California, since about 1960. PL has infested the Grayback/Sucker Creek drainage near the Oregon Caves National Monument. POC are most often found in riparian areas within the Wild Rivers Ranger District. Generally, POC is within 100 feet of the stream; however, small groves of POC can be found on alluvial fans and benches along these streams. Crown closure in the streamside areas are from 10 to 50 percent **Invalid source specified.**.

The mechanisms for additional spread of *P. lateralis* (the pathogen which causes Port-Orford-cedar root disease) are the use of heavy equipment to access and remove culverts, recontour slopes and stormproof roads. Other mechanisms include creation of harvest and service landings and temporary roads for harvest operations. Ground based harvest equipment has the highest risk of spread among harvest types. Skyline equipment's risk is lower than ground based yet it still has risk due to the type equipment used. Helicopter has the least risk however there is still risk if left unmitigated due to cutters and choker setters and their associated equipment. The unit of measure is ***risk*** of spread of *P. lateralis* in addition to existing uncontrollable risk (such as along a primary access road).

Upper Briggs Restoration Project Analysis Area contained about 29 acres of POC along road systems and 0 acres of *P. lateralis* infestation (along roadsystems). The analysis area contains six **uninfested 7th field** watersheds**.** The proposed activities with uninfested 7th field watersheds are located in table one.

Table 1. Proposed Action Treatments within 7th Field Watersheds.

7th Field Watershed	(approximate acreage)	Proposed Activity
11U07W		
Unit 165	0.8	DELSH
11U11F		

Unit 36	1.1	DELSH/FMZ
Total Acres in 7th field watersheds	1.9	
Unit Measurably contributing yet not in a 7th field Watershed		
Unit 50	0.3	Meadow Restoration
Total Acres Measurably Contributes	2.2	

Table 2. Proposed Action treatments common to Alternative 2 and Alternative 3

Road Work (Decommissioning, Storm Proofing, Maintenance)		
7th Field Watershed	**Forest Service Road**	**(approximate length in miles)**
09U16W	2402000	0.001
	2510000	0.001
09U16W Total		**0.003**
11B02W	2500700	0.030
11B02W Total		**0.030**
11B08W	2512048	0.010
11B08W Total		**0.010**
11O05F	2500141	0.003
	2500170	0.098
	2500224	2.013
	2500243	0.491
	2500655	0.538
	2500656	0.726
	2500658	0.254
	2500690	0.686
	2500692	0.072
	2500694	0.486
	2500700	2.044
	2500704	0.303
11O05F Total		**7.714**
11U01F	2402181	0.501
	2500129	0.037
	2500139	0.179
	2500141	0.063
	2500627	0.060

	2500660	0.175
	2512000	0.653
	2512017	0.584
	2512040	2.548
11U01F Total		**4.800**
11U02W	2402000	0.449
	2402180	0.059
	2402181	0.577
	2512000	0.840
	2512048	0.517
11U02W Total		**2.444**
11U03F	2500000	3.593
	2500129	0.034
	2500138	4.437
	2500139	0.435
	2500141	0.984
	2500152	0.496
	2500160	0.057
	2500162	0.023
	2500181	0.863
	2500184	0.269
	2500187	0.280
	2500627	0.187
	2500630	0.106
	2500632	0.008
	2500633	0.067
	2500634	0.091
	2500636	0.043
	2500640	1.218
	2500641	0.356
	2500643	0.275
	2500646	0.187
	2500660	0.034
	2500665	0.142
	2500667	0.017
	2500668	0.117
	2500674	0.025
	2500675	0.006
	2512040	0.699
11U03F Total		**15.050**

11U07W	2402000	0.719
	2402149	0.103
	2402150	0.202
	2402154	0.167
	2402157	0.006
	2402158	0.507
	2402610	0.587
	2512000	0.444
	2512015	0.267
	2512016	0.557
	2512017	0.030
	2512637	0.134
11U07W Total		**3.724**
11U11F	2500100	0.932
	2500607	0.401
	2510000	1.687
	2510037	0.399
	2510038	0.370
	2512015	0.032
11U11F Total		**3.821**
11U12W	2402000	0.268
	2510000	1.487
	2510037	0.924
	2510050	0.035
	2510051	0.660
	2510588	0.694
11U12W Total		**4.067**
11U13W	2402000	1.805
	2402149	0.118
	2402150	0.438
	2402610	0.336
11U13W Total		**2.697**
18S07W	2500000	0.004
	2500687	0.001
18S07W Total		**0.005**
18S09W	2500687A	0.014
	2706000	0.667
18S09W Total		**0.681**
26F08W	2706000	2.021
26F08W Total		**2.021**

26F11W	2706000	0.042
26F11W Total		**0.042**
26T10W	2500000	0.341
	2510038	0.006
26T10W Total		**0.347**
Grand Total		**47.455**
Total Miles by Activity	3.95 Miles	Storm Proofing
	.80 Miles	Storage
	.75 Miles	Decommission
Grand Total Miles for all 7th Field Watersheds within the Analysis Area	**Miles**	**Activity**
	20.87	Storm Proofing
	7.54	Storage
	6.58	Decommission

Table 2. Alternative 3 Treatments within 7th Field Watersheds.

7th Field Watershed	**(approximate acreage)**	**Proposed Activity**
11U07W		
Unit 165	0.63	DELSH Dispersal Habitat (Managed Stand)
Total Acres in 7th field watersheds	0.63	
Unit Measurably contributing yet not in a 7th field Watershed		
Unit 50	0.3	Meadow Restoration
Total Acres Measurably Contributes	1.1	

Project activities by alternative are summarized below in table three and table four.

Table 3. Project activities in areas of measurably contributing POC – By Alternative

Alternative	Total Road Treatment Length (miles)	Total Acres of Measurably Contributing POC
Alternative 2	22.91	2.18
Alternative 3	22.91	0.63

Table 4. Project activities in areas of existing PL – By Alternative

Alternative	Total Road Treatment Length (miles)	Total Acres PL Infestation
Alternative 2	0	0
Alternative 3	0	0

Alternative 2– Effects on Spread of P. lateralis

Port-Orford-cedar Risk Key Analysis

Map - A map of proposed road activities which intersect measurably contributing Port-Orford-cedar or *P. lateralis* infestations is included at the end of this appendix (figure one). It also maps the six uninfested 7th field watersheds within the Upper Briggs Restoration Project analysis boundary.

Port-Orford-cedar (POC)

Port-Orford-cedar (*Chamaecyparis lawsoniana*) is native to a limited area along the Pacific Coast from Coos Bay, Oregon, to the mouth of the Mad River near Arcata, California. Its range extends from the coast to about 50 miles inland. There is also a small disjunct population in the Scott Mountains of California.

On the Rogue River – Siskiyou National Forest, updated inventory data shows Port-Orford-cedar (POC) occurs on approximately 133,000 acres on the Gold Beach, Powers, and Wild Rivers Ranger Districts. About 12,700 acres (8.7%) are infested with *Phytophthora lateralis*, the pathogen that causes POC root disease.

Port-Orford-cedar program objectives are to maintain POC as an ecologically and economically significant species on National Forest (NF) lands. Port-Orford-cedar management will provide cost-effective mitigation for controllable activities creating appreciable additional risk to important uninfected POC, not to reduce all risk to all trees at all cost (USDA-FS 2004). Port-Orford-cedar management slows the spread of the non-native pathogen *Phytophthora lateralis* (PL) enough to maintain POC's significant ecological and economic functions, without the cost of the management strategy exceeding its effect on the value of these functions.

Phytophthora lateralis (PL)

Phytophthora lateralis is a virulent, non-native pathogen. It was introduced into the native range of POC in the early 1950s and its place of origin is unknown. It readily kills POC of all ages that are growing on sites favorable for infection. Once an area becomes infested, it is difficult to eradicate PL.

Phytophthora lateralis is spread via water or soil. A typical spread scenario involves infested soil being transported into an un-infested area on a vehicle or piece of equipment or, potentially, in infested water being transported in the tanks of fire engines or helicopter buckets during fire suppression activities. The infested soil falls off of the vehicle or spores are delivered via water and the pathogen first infects POC near the site of introduction. New spores from that infection are then washed downhill in surface water infecting additional hosts. This is especially lethal along drainages and creeks where infested water is channeled and flows near concentrations of healthy POC.

Factors Affecting Pathogen Spread

When evaluating the likelihood of long-distance spread to and establishment of PL into a new area, consideration needs to be given to the probabilities that: (1) viable inoculum will be picked up at an infested source; (2) the inoculum will be carried to a particular uninfested area; (3) the inoculum will remain viable during transit; (4) the inoculum will be deposited in the new site; and (5) the inoculum deposited will infect a POC and disease establishment will result. A number of factors influence inoculum accession, spread, and establishment of PL, especially:

> **Character of site of origin:** The potential for carriers of PL entering a possible inoculum source area varies, and is dependent upon the characteristics of the site entered. Inoculum clearly will not be available on a site with no infection. Areas with obvious infection of POC and where certain kinds of wet conditions prevail, are the most likely places for inoculum to be acquired.
>
> **Type of carrier:** Vehicles (both motorized and non-motorized), equipment, humans on foot, and animals (especially cows, horses, and elk) have been implicated in carrying PL. Probability of successful spread is greater with the larger carriers, those that transport greater amounts of soil, carriers most likely to access infested areas, and those that can rapidly travel to new sites.
>
> **Time of year of transport event:** Likelihood of acquiring inoculum, successfully transporting it, and establishing disease at a new site are greatly favored by cool temperatures, and probability of infection is much greater during wet periods than dry periods. Also, inoculum is most likely to be picked up from an infested site during a wet period when infested soil is muddy and prone to adhere to the carrier. Probability of spread and establishment of new infections is greater with soil movement in late fall, winter, and early spring than summer, and is greater in rainy rather than dry weather.
>
> **Distance traveled and associated time elapsed:** Probability of successful delivery of viable inoculum from one site to another decreases with distance traveled and associated time elapsed since inoculum was picked up.

Factors Affecting Risk of Infection

Jules et al. (2002) showed that the incidence of new POC infection was positively associated with 3 factors:

> **1) Distance to the nearest POC**
>
> In infested streams, the mean distance from a road crossing a stream to the nearest POC was 10.5 meters. In uninfested streams, the mean distance from a road crossing a stream to the nearest uninfected POC was 117.7 meters.
>
> **2) Host abundance**
>
> In infested streams, the mean number of trees in proximity to the road crossing was 18.5 POC. In uninfested streams, the mean number of trees in proximity to the road crossing was 6.3 POC.
>
> **3) Catchment area**
>
> Catchment area is most directly an indicator of streamflow in the creek. Crossings with high catchment area were more likely to have flowing water during summer months while low catchment areas were seasonal. Mean catchment area, for infested streams, was 3,924.5 square kilometers compared to 1,759.3 square kilometers for uninfested streams.

Knowing which factors are associated with incidence of new infection sites is an important tool in reducing the potential for spread of the pathogen and occurrence of new infection. There is an important distinction that must be made when reviewing the information provided by Jules *et al*. The first incidence of infection in this study was dated as 1977. This is several years before the 1988 completion date of the Region 5-Region 6 Port-Orford-Cedar Root Disease Action Plan. Exactly which type(s) of mitigation were employed (if any) in the study area from 1977 to the adoption of the Action Plan is unclear. The paper's conclusions do not account for the more rigorous and routine mitigation required under the March, 2004 management direction.

The question of finality of infestation of *Phytophthora lateralis* is an open one. Anecdotal evidence collected during monitoring from the Biscuit Fire has shown the following: Twenty-one of twenty-two plots planted in spring 2004 with non-resistant POC had mortality caused by *Phytophthora lateralis*. *Phytophthora lateralis* mortality in the fall 2004 planting has declined from that seen in spring, 2004. Fewer plots showed *Phytophthora lateralis* - caused seedling mortality and fewer seedlings overall were infected. *Phytophthora lateralis* mortality declined to thirteen, nine, six, and one plot in 2005, 2006, 2007, and 2008 respectively. Two plots showed *Phytophthora lateralis* in 2009. This reduction may indicate an adverse effect on *Phytophthora lateralis* survival post fire but additional investigation is needed.

High-risk sites:

Low-lying wet areas (infested or not) that are located downslope from already infested areas or below likely sites for future introductions, especially roads are high risk sites. They include streams, drainage ditches, gullies, swamps, seeps, ponds, lakes, and concave low lying areas where water collects during rainy weather (USDA-FS 2004). High risk sites are defined as streamside POC within 100 feet of a road and non-streamside POC within 50 feet of a road.

Low-risk sites:

These are sites with characteristics unfavorable for spread and infection by PL (USDA-FS 2004). Low risk sites are defined as streamside POC greater than 100 feet from a road and non-streamside POC greater than 50 feet from a road.

For the purposes of this analysis, probability of spread and establishment of PL in new previously uninfested areas below 6.1% is considered low risk. Probability figures are based on literature and professional judgment of forest pathologists with substantial amounts of experience evaluating PL in the laboratory and in the field.

Risk Regions

The range of POC is divided up into three main risk regions: 1) North Coast - 20 percent high risk sites, 2) Siskiyou - 40 percent high risk sites), and 3) Inland Siskiyou - 60 percent high risk sites) and the Disjunct California Risk Region - 40 percent high risk sites (USDA-FS USDI-BLM 2004a).

Siskiyou Risk Region

The Siskiyou Risk Region includes the Coastal Siskiyous, Siskiyou Mountains, and Gasquet Mountain ultramafics located in Oregon and California. In the northwest part of the region, the coastal Siskiyous have highly dissected mountains and high gradient streams, as well as a few, small, alpine glacial lakes. The climate is wetter with more maritime influence then the Siskiyou and Klamath Mountains to the south. The Coastal Siskiyou area has tanoak, Douglas-fir, and some POC. Western hemlock is present, but not a dominant overstory species. This region has a high diversity of ecological conditions, which is reflected in the vegetation.

In the middle of the region, the Siskiyou Mountains are higher and steeper than the other portions of the cedar's range in Oregon. The vegetation is dominated by Douglas-fir at low elevations, Jeffrey pine on ultramafic soils, and white fir and red fir series at higher elevations.

In the South Portion of this region, populations of POC are highly scattered across the landscape and within many vegetation types. Marine air moderates temperatures in the western portion of this area, creating a temperate-to-humid climate near the coast. Douglas-fir and tanoak are the predominate trees in this part of the region. The southern extreme of this region stretches to the southwest edge of the Klamath Mountains and into the northern California Coast Range. Many of the isolated populations of POC in this part of the region are often found on ultramafic soils.

The Wild Rivers Ranger District falls within the Siskiyou Risk Region.

Measurably Contributing Port-Orford-cedar – Wild Rivers Ranger District:
For the Wild Rivers Ranger District, POC canopy cover of six percent or greater is the threshold for POC that measurably contributes to meeting management objectives.

Uninfested 7th field watersheds
"Uninfested 7th field watersheds" are watersheds with greater than 50 percent Federal ownership and with greater than one hundred Federal acres in stands that include POC (not including plantations where POC did not previously occur), where at least the Federal lands are uninfested or essentially uninfested with PL. These stands occur in Matrix as well as various Reserve land allocations. Uninfested POC stands within these watersheds are referred to as POC cores. POC cores are not necessarily contiguous acres. Analysis done for the POC FSEIS using existing GIS stand mapping indicates there were 162 uninfested 7th field watersheds in Oregon at the time the plan amendment was done (BLM and FS) (USDA-FS 2004).

Watersheds no longer qualify for POC cores if 5 percent or more of the POC core area becomes infested with PL. Because these watersheds sometimes empty into larger streams that are infested, infestations within the lowest 2 acres of the watershed (and lowest 200 feet of stream) do not count against the current uninfested status or the 5 percent rule (USDA-FS 2004).

A map of the seventh field watersheds identified in the POC FSEIS can be found at:
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316274.pdf.

POC Risk Key Explanation

The Port-Orford-cedar Risk Key is used to clarify the environmental conditions that require implementation of one or more of the disease controlling management practices listed in the Record of Decision (ROD) and Land and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon Siskiyou National Forest. Project-specific NEPA analysis will appropriately document the application of the risk key and the consideration of the available management practices. Application of the risk key and application of resultant management practices (if any) will make the project consistent with the mid- and large-geographic and temporal-scale effects described by the FSEIS analysis, and will permit the project analysis to tier to the discussion of those effects (USDA FS 2004).

The objective of the risk key is to identify project areas/situations where new infections should be avoided, and guide the application of one or more of the management practices until the risk is acceptably mitigated. The risk key describes circumstances under which the various risk reducing management practices will be applied where needed.

Under Alternative 2 , there would be a very low probability of additional risk of spread of P. lateralis (0 to 2 percent probability of occuring). Without mitigation, the relative probability would be very high (50.1 to 100 percent probability of occuring) for the proposed activities, so the proposed integrated management practices described below would be very effective at decreasing that risk.

Applicable POC ROD Management Recommendations

1) **Project Scheduling:** Schedule project activities during the dry season (June 1 – September 30)

2) **Access:** Designate access and egress routes to minimize exposure to PL

3) **Resistant POC Planting:** Site specific based on uninfected areas where the proposed action treatment for a road either storage or decommission. *See revegetation plan in Botanical appendix*

4) **Washing Project Equipment:**

a) Wash project equipment, work boots and hand tools before entering National Forest land for the first time in the work period. Wash equipment again before entering National Forest lands if work is halted and equipment is taken to another job site or for any reason equipment is taken to another job site away from this project.

b) Wash project equipment, work boots and any hand tools after working in each area where PL is already known to be present and before working on the next scheduled site.

c) Wash stations will be established through coordination with the botanist and the contract inspector on the project.

d) Wash stations would follow the design recommended in the *Attachment 2: General Specifications for a Washing Station and Equipment Cleaning Checklist* POC FSEIS ROD 2004. This design will consist of a 6" rock lift from the existing road surface and be at least 1.5 times the length of the longest truck used in operations. Water would be caught at the lowest point off of the road in a hole lined with bio mesh that would be disposed of by burning or bagged and disposed to a landfill to remove any invasive weed seeds.

e) A wash station may also be a mobile wash station that can be moved from site to site for cleaning of the equipment. The mobile wash station mush use treated water following the below criteria for bleach concentration. Wash station filters would be bagged and disposed of in a landfill to prevent spread or establishment of invasive plant seeds or materials.

5) **Utilizing Uninfested Water**: Use uninfested water sources for planned activities such as equipment washing, road watering, and other water-distribution needs, or treat water with Ultra Clorox®, at a rate of 1 gallon of bleach/1000 gallons of water.

6) **Routing Recreation use:** Rout new trails (off-highway vehicle, motorcycle, mountain bike, horse, and foot) away from areas with POC or PL, or provide other mitigation such as seasonal closures. Trailheads will be relocated and/or established trails will be rerouted in the same matter where trails present significant risk to POC, or provide other mitigation such a site hardening.

7) **Summer Rain Events:** Apply permit or contract clause or otherwise require cessation of operations when indicators such as puddles in the roadway, water running in roadside ditches, or increase in soils moisture (as by moisture meter or equivalent) indicate an unacceptable increase in the likelihood of spreading PL.

Potential for pathogen spread - Short Term

Potential for the spread of *Phytophthora lateralis*, the pathogen that causes Port-Orford-cedar root disease is not simply a function of how many acres are entered. Rather, it is a function of a number of factors including acres entered with healthy POC, acres entered with PL, and management on these acres. Employing a planned combination of treatments can reduce probability of PL spread more than a single treatment. An integrated treatment program that uses a combination of reducing access, project scheduling, unit scheduling, washing equipment utilizing treated water using Ultra Clorox©, resistant POC planting, Routing recreation use, restrictions placed on operations during summer rain events and public education reduces the potential for spreading PL.

Estimated pathogen spread - Long Term

The Wild Rivers Ranger District is within the Siskiyou Risk Regions for POC.

Of the 116,376 POC acres in the Siskiyou Risk Region 40% are considered to be high risk (46,549 acres). At this time approximately 31% of the high-risk site in the region is considered infested (12,801 acres). In 100 years, the predicted amount of infested acres in the Siskiyou Risk Region is predicted to increase to 51 percent of high-risk sites (approximately 59,439 acres).

These estimates cover all management activity for the Forest Service and BLM. A more complete discussion of risk and rate of spread can be found in the POC FSEIS (USDA FS and USDI BLM 2004). Application of the risk key and application of resultant management practices will make the project consistent with the mid- and large-scale geographic and temporal-scale effects described by the analysis in the Final Supplemental Environmental Impact Statement – Management of Port-Orford-Cedar in Southwest Oregon.

Alternative 2 Proposed Action

Application of the Risk Key

1a. Are there uninfected POC within, near[4], or downstream of the activity area whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?

YES

1b. Are there uninfected POC within, near or downstream of the activity area that, were they to become infected, would likely spread infections to trees whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?

YES

[4] In questions 1a and 1b, "near" generally means within 25 to 50 feet downslope or 25 feet upslope from management activity areas, access roads, or haul routes; farther for drainage features; 100 to 200 feet in streams.

1c. Is the activity area within an uninfested 7th field watershed[5]

YES –
09U16W,11B02W,11B08W,11O05F,11U01F,11U02W,11U03F,11U07W,11U11F,
11U12W,11U13W,18S07W,18S09W,26F08W,26F11W,26T10W

If the answer to all three questions, 1a, 1b, and 1c, is no, then risk is low and no POC management practices are required. If the answer to any of these three questions is yes, continue.

2. Will the proposed project introduce appreciable additional risk[6] of infection to these uninfected POC?

YES -

Table 4. Project activities in areas of existing PL – By Alternative

Alternative	Total Road Treatment Length (miles)	Total Acres PL Infestation
Alternative 2	0	0
Alternative 3	0	0

Alternative 3

The difference between alternaitve 2 and three result in the 1.5 acre change in the risk of spread of Pl. All proposed roadwork would still occur with alternative 3 and therefore risk would be the same as alternative 2.

Table 4. Project activities in areas of existing PL – By Alternative

Alternative	Total Road Treatment Length (miles)	Total Acres PL Infestation
Alternative 2	0	0
Alternative 3	0	0

Environmental Consequences

Alternative 1 (No-Action)

[5] Uninfested 7th field watersheds are defined and listed in the POC FSEIS, and are those with at least 100 acres of POC stands, are at least 50% federal ownership, and are free of PL except within the lowermost 2 acres of the drainage.
[6] Appreciable additional risk does not mean "any risk." It means that a reasonable person would recognize risk, additional to existing uncontrollable risk, to believe mitigation is warranted and would make a cost-effective or important difference.

Direct and Indirect Effects
There are no direct effects of choosing the no-action alternative.

There would be no additional risk of spread of *P. lateralis* under Alternative 1 because no project activities would occur within the Upper Briggs Restoration Project Analysis area. PL infestation would continue to increase over time because of the presence of PL outside of the proposed action. Over the next 5 to 20 years, four to five new acres of root disease would be estimated to occur along streams that flow through areas of measurably contributing POC. Less than one new acre of root disease is expected annually where PL areas and healthy POC are adjacent to each other.

Alternative 2 (Proposed Action)

Port-Orford-cedar

Direct and Indirect Effects

Under Alternative 2, there would be a very low probability of additional risk of spread of P. lateralis (0 to 2 percent probability of occurring). Without mitigation, the relative probability would be very high (50.1 to 100 percent probability of occurring).

The proposed action would reduce the risk of P. lateralis by reducing road densities with the Upper Briggs Restoration Project 6^{th} field watershed. Most importantly the reduction of road densities in the fifteen 7^{th} field uninfested watersheds would be reduced by 6.6 miles. 7.5 miles of roads that are put into the storage will also provide at least ten years of reduced risk of new infestations of P. lateralis in the 7^{th} field uninfected watersheds. Total reduction of access through decommissioning and storage would be 40% of roads in the 7^{th} field uninfested watersheds. The reduction of road densities will have indirect effect that will reduce risk of new P. lateralis infestations. This reduction of risk would help to preserve the POC cores in the watersheds.

Cumulative Effects – Spread of P. lateralis

The effects of management prior to the 2004 POC Record of Decision are described as Alternative 1 in the *Final Supplemental Environmental Impact Statement Management of Port-Orford-cedar in Southwest Oregon****Invalid source specified.*** and are incorporated by reference.

The vast majority of recreational traffic is during dry weather conditions, when the spread of P. lateralis is less likely (as discussed in detail in the POC FSEIS).

Other projects considered in cumulative effects analysis are vegetation activities as part of the, *Plantation and Hazardous Fuels Treatment Environmental Analysis ROD 2002* All projects utilize an integrated approach to management practices regarding reduction of risk of spread of P lateralis. Each projects risk of spread was zero to two percent risk of spread therefore the total risk of spread of P. lateralis including this project is zero to eight percent.

Application of the risk key and the resultant management practices makes the action alternative for this project consistent with the mid- and large-scale geographic and temporal-scale effects described by the analysis in the POC FSEIS. These estimates cover all management activity for the Forest Service and BLM. A more complete discussion of risk and rate of spread can be found in the POC FSEIS**Invalid source specified.**.

Alternative 3

Port-Orford-cedar

Direct and Indirect Effects

Cumulative Effects – Spread of P. lateralis

The effects of management prior to the 2004 POC Record of Decision are described in the *Final Supplemental Environmental Impact Statement Management of Port-Orford-cedar in Southwest Oregon***Invalid source specified.** and are incorporated by reference.

The vast majority of recreational traffic is during dry weather conditions, when the spread of P. lateralis is less likely (as discussed in detail in the POC FSEIS).

Other projects considered in cumulative effects analysis are vegetation activities as part of the *East Illinois Managed Stand Environmental Analysis ROD 2007, Plantation and Hazardous Fuels Treatment Environmental Analysis ROD 2002* and *Meadow Restoration and Enhancement 2005.* All projects utilize an integrated approach to management practices regarding reduction of risk of spread of P lateralis. Each projects risk of spread was zero to two percent risk of spread therefore the total risk of spread of P. lateralis including this project is zero to eight percent.

Conclusion / Summary

Port-Orford-cedar

At a regional level, this project would not increase the acres of infestation beyond those estimated in the POC FSEIS for the next 100 years. Twenty percent of the sites in the Siskiyou Risk Region are considered to be high risk (25,250 acres). At this time approximately fifteen percent of the risk region is considered infested (18,900 acres). This level of infestation on the Wild Rivers Ranger district is below the infestation level for the Risk Region as a whole. In 100 years, the predicted amount of infested acres in the Siskiyou Risk Region is predicted to increase to 17 percent of high-risk sites (approximately 20,800 acres).

The Upper Briggs Creek restoration proposed action would utilize an integrated management approach to mitigate the spread of P. lateralis. The combination of Project Scheduling, Unit Scheduling, and Control of access, Washing, Utilizing Uninfested Water or treated water for operations, Planting resistant POC, Routing Recreation use, and applying restrictions during summer rain events incorporates key recommendations to reduce the risk of P. lateralis spread or introduction of new infestations. This integrated management approach would reduce the risk of spread of P. lateralis to 0 to 2% POC ROD, Reference 2**Invalid source specified.**.

Attachment 1 – Mitigation Measures

Describe mitigation measures that you recommend for the project, and specify whether the measure should be applied to all roads, a subset of roads, a single road, or a specific treatment.

Project design criteria/mitigation measures	Objective	Applies to	Source	Effectiveness / feasibility rating
Project Scheduling: Schedule project activities during the dry season (June 1 – September 30)	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3
Unit Scheduling: Conduct work on roads where PL is not present before working on sites infested with PL. List of roads infested with PL	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3
Access: Designate access and egress routes to minimize exposure to PL	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3
Resistant POC Planting: Site specific based on uninfected areas where the proposed action treatment for a road either storage or decommission. (See Attachment 3)	Introduce resistant POC into uninfested locations where vegetation removal occurs in the project area.	ALL roads that receive Storage or Decommissioning Treatments	POC ROD FSEIS 2004	E2 / F2

Project design criteria/mitigation measures	Objective	Applies to	Source	Effectiveness / feasibility rating
Washing Project Equipment: a) Wash project equipment, work boots and hand tools before entering National Forest land for the first time in the work period. Wash equipment again before entering National Forest lands if work is halted and equipment is taken to another job site or for any reason equipment is taken to another job site away from this project. b) Wash project equipment, work boots and any hand tools after working in each area where PL is already known to be present and before working on the next scheduled site. c) Wash stations will be established through coordination with the botanist and the contract inspector on the project. d) Wash stations will follow the design recommended in the Attachment 2: General Specifications for a Washing Station and Equipment Cleaning Checklist POC FSEIS ROD 2004. This design will consist of a 6" rock lift from the existing road surface and be at least 1.5 times the length of the longest truck used in operations. Water would be caught at the lowest point off of the road in a hole lined with bio mesh that would be disposed of by burning or bagged and disposed to a landfill to remove any invasive weed seeds. e) A wash station may also be a mobile wash station that can be moved from site to site for cleaning of the equipment. The mobile wash station mush use treated water following the below criteria for bleach concentration. Wash station filters would be bagged and disposed of in a landfill to prevent spread or establishment of invasive plant seeds or materials.	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3

Project design criteria/mitigation measures	Objective	Applies to	Source	Effectiveness / feasibility rating
Utilizing Uninfested Water: Use uninfested water sources for planned activities such as equipment washing, road watering, and other water-distribution needs, or treat water with Ultra Clorox®, at a rate of 1 gallon of bleach/1000 gallons of water.	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3
Routing Recreation use: Rout new trails (off-highway vehicle, motorcycle, mountain bike, horse, and foot) away from areas with POC or PL, or provide other mitigation such as seasonal closures. Trailheads will be relocated and/or established trails will be rerouted in the same matter where trails present significant risk to POC, or provide other mitigation such a site hardening.	Minimize risk of introducing new P. lateralis infestations to unifected POC	4612098 Decommissioning site and trail head construction at the junction of the 4612098 and the 4612540	POC ROD FSEIS 2004	E 2.4 / F3
Summer Rain Events: Apply permit or contract clause or otherwise require cessation of operations when indicators such as puddles in the roadway, water running in roadside ditches, or increase in soils moisture (as by moisture meter or equivalent) indicate an unacceptable increase in the likelihood of spreading PL	Minimize risk of introducing new P. lateralis infestations to unifected POC	ALL uninfected POC populations	POC ROD FSEIS 2004	E 2.9 / F3

*Effectiveness Ratings follow information provided by *Reference 2: Final SEIS Pathology Discussion of Disease Spread and Effectiveness of Management Techniques to Prevent Spread POC ROD 2004.*

Attachment 2 – Monitoring Requirements

The project inspector would insure compliance with the contract that would include the appropriate disease control prescriptions. This includes the entire project area and travel routes.

Forest-level POC monitoring is on-going as follows:

- Healthy and diseased stands have been identified. Summaries of disease status and the use of control strategies will be completed and reported to the Forest level for completion of their annual report that coincides with the interregional summary and report.
- The USDA-FS Southwest Oregon Forest Insect and Disease Service Center continues to evaluate and coordinate existing management techniques to reduce the occurrence of *P. lateralis* and retain healthy Port-Orford-cedar.
- Sampling of uninfested 7th watershed would occur by baiting *P. lateralis* with nonresistant POC seedlings to validate uninfected status post treatment activities.

Literature Cited

Oliver, C.D. and B.C. Larson. 1996. Forest stand dynamics, update edition. John Wiley and Sons, Inc. New York, NY. 520 pp.

USDA Forest Service. 2004. Record of decision and land and resource management plan amendment for management of Port-Orford-Cedar in Southwest Oregon, Siskiyou National Forest. Medford, OR. 63 pp.

United States Department of Agriculture, Forest Service. 1989*a*. Siskiyou National Forest Land and Resource Management Plan. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon.

United States Department of Agriculture, Forest Service. 1989*b*. Siskiyou National Forest Land and Resource Management Plan. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5315175.pdf

United States Department of Agriculture, Forest Service, and United States Department of the Interior, Bureau of Land Management. 1994*a*. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service, Pacific Northwest Region, Portland, Oregon.

United States Department of Agriculture, Forest Service, and United States Department of the Interior, Bureau of Land Management. 1994*b*. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. USDA Forest Service, Pacific Northwest Region, Portland, Oregon. Available online at: http://www.reo.gov/library/reports/newroda.pdf

United States Department of Agriculture, Forest Service. 1995. Grayback/Sucker Pilot Watershed Analysis Version 1.0. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316123.pdf

United States Department of Agriculture, Forest Service. 1998. Grayback/Sucker Pilot Watershed Analysis Version 1.1, a Supplement Grayback/Sucker Pilot Watershed Analysis Version 1.0. USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5316127.pdf

United States Department of Agriculture, Forest Service. 2004. Rogue River-Siskiyou National Forest Roads Analysis. USDA Forest Service, Pacific Northwest Region, Rogue River-Siskiyou National Forest, Medford, Oregon.

United States Department of Agriculture, Forest Service. 2011. Watershed Condition Framework, FY2011 Transition Watershed Restoration Action Plan, Upper Briggs CreekWatershed. USDA Forest Service, Pacific Northwest Region, Rogue River-Siskiyou National Forest, Medford, Oregon.

United States Department of the Interior, Bureau of Land Management, and United States Department of Agriculture, Forest Service. 1995. Southwest Oregon Late-Successional Reserve Assessment.

USDI Bureau of Land Management, Medford District, Medford, Oregon; and USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5315197.pdf

United States Department of the Interior, Bureau of Land Management, and United States Department of Agriculture, Forest Service. 2004. Southwest Oregon Late-Successional Reserve Assessment, 12 May 2004 Update. USDI Bureau of Land Management, Medford District, Medford, Oregon; and USDA Forest Service, Pacific Northwest Region, Siskiyou National Forest, Grants Pass, Oregon. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5315198.pdf

Whittaker, R.H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecological Monographs.30(3): 279-338.

Appendix B: Letter from Southwestern Forest Insect and Disease Center

File Code: 3410 **Date:** May 5, 2014

Route To:

Subject: Service trip to proposed Briggs Valley Project area

To: Jeff vonKienest, acting District Ranger, Wild Rivers Ranger District

On April 11, 2014, Bill Schaupp, entomologist, and Josh Bronson, plant pathologist, accompanied Rob Barnhart, silviculturist, on a visit to the Briggs Valley Project area. The purpose of our visit was to examine the existing forest condition with respect to forest insects and tree diseases, either active or anticipated, in areas under consideration for treatment. Special emphasis was placed on the oldest conifer age cohort, composed of large diameter, tall ponderosa pine and Douglas-firs, including individual ponderosa pine considered the tallest in the world.

We conducted walk-through surveys in parts of Units 3, 11 and 12 of the Proposed Action Alternative in the Briggs Valley Project, described in the draft revision dated August 19 & 29, 2012, provided by Don Bellville (Wild Rivers RD, retired) on a previous site visit. These Units are located in T36S, R8W, Sections 5, 6, 7, and 8 (Willamette Meridian).

Based on data provided in the Proposed Action Alternative and our observations in the field, vegetation densities are high to extreme and basal areas high to very high in the Units we visited (Table 1). Combined with Unit 2, these four Units cover 313 acres and contain 248 trees greater than 39.0 inches DBH (227 ponderosa pine; 3 sugar pine; 18 Douglas-fir), all of which have been inventoried, evaluated, and tagged. Wide, thick, retained branches on the lower crowns of the larger Douglas-fir trees and the high proportion of pine among those largest trees indicates that these sites were once much more open. The relative paucity of stumps and lack of fire scorch on tree stems are two indicators that these sites have not had large-scale disturbance for many years. We also observed high canopy closure percentage throughout the area. As would be expected, the more shade tolerant Douglas-fir dominates mid- and lower canopy layers, where present.

The densities we observed, based on basal area per acre, are greater than those where competition-mediated mortality is expected to begin. Increased competition among trees and reduced tree vigor increases susceptibility to attack from tree-killing bark beetles, other forest insects, and several diseases. The basal area threshold for elevated risk of pine bark beetle infestation in southwest Oregon on a highly productive site is 120 to 150 ft^2/ac. Even on this uniquely productive site, basal areas are about two to three times more than the density above which a high probability of pine beetle-caused mortality exists. This probability increases during droughty periods.

Table 1. Average trees per acre and density, measured as basal area per acre, for four Units in the proposed Briggs Valley Project that contain a high proportion of large diameter, exceptionally tall trees

UNIT	Gross Acres	All DBH (Diameters)			7 inch DBH and Larger		
		Basal Area/Acre (ft^2/ac)	Trees per Acre	Average Spacing (ft)	Basal Area/Acre (ft^2/ac)	Trees per Acre	Average Spacing (ft)
2	71	284	3,095	3.8	234	64	26.1
3	68	424	2,586	4.1	417	100	20.9
11	75	337	2,543	4.1	326	127	18.5
12	99	263	3,359	3.6	236	120	19.1

No conifer-killing insects were found currently active within the areas examined, although the diagnostic serpentine gallery patterns of the western pine beetle, *Dendroctonus brevicomis*, were found on the bark underside of dead standing and fallen trees, demonstrating past beetle-caused pine mortality. Such beetle-caused mortality is ongoing in the Briggs Valley, as estimated by annual aerial detection surveys. From 2003 through 2013 in the 12 mi^2 that contain the proposed project sites (Sections 4 to 9 & 16 to 21), aerial surveys mapped mortality of 52 large pines attributed to bark beetles, ranging from 0 to 12 per year. Also during that period there, 36 killed Douglas-firs were mapped and attributed to flatheaded fir borer, *Phaenops drummondi*. Aerial detection surveys are reconnaissance rather than a quantitative sample and often underestimate numbers of killed trees; most of the pine mortality was coded mountain pine beetle (*D. ponderosae*) in sugar pine, although likely western pine beetle in ponderosa pine represents the majority of what was observed, based on how few sugar pine are present in the area. This level of beetle-caused mortality is slightly elevated above what is considered background or endemic, but could rise dramatically under inciting conditions such as warm winters, a prolonged drought or an abundance of stressed hosts such as created by fire or root disease.

We also investigated a concentration of downed pine in Section 3 just northwest of NF Road 100. Several tipped-up root systems and lower stems had thick mycelial fans of *Armillaria ostoyae*, the cause of Armillaria root disease. A site-specific evaluation would be needed to determine the host preferences and virulence at this location, although it is apparent that this pathogen is having an impact on this particular stand and is likely affecting others in the area as well. Trees infected by *A. ostoyae* are often attacked by bark beetles. Armillaria root disease may create large openings where highly susceptible species never attain large size.

In the eastern portion of Unit 11A, we came to a location devoid of understory trees or shrubs where some intermediate-sized ponderosa pine appeared to be growing well. Amidst this pine patch is a small area of downed Douglas-firs that are affected by *Phellinus weirii*, the pathogen that causes laminated root rot. Laminated root rot frequently creates substantial-sized openings where highly susceptible species such as Douglas-fir never attain large size. Ponderosa and sugar pines are seldom infected and almost never killed by laminated root rot. This disease center may have been colonized by ponderosa pine as a consequence of differential host susceptibility to *P. weirii*. This young pine patch is notable because we did not see many pines less than several hundred feet tall on our site visit.

Dwarf mistletoe infection of Douglas-fir and ponderosa pine was also detected in our walk-through surveys, but at very low levels and in few locations.

Given no action, it is likely that the number of pines among the oldest conifer age cohort in these Units will decrease substantially, killed by competitive interactions, soil compaction from visitors, and/or insect and disease impacts. This may occur gradually, as is currently the case, or suddenly, given a western or mountain pine beetle epidemic. Most of these very large, exceptionally tall pines will not regenerate and their locally-adapted genetic composition will be lost. In these dense, closed-canopy stands, pine regeneration would require disturbances that produce openings of sufficient size.

The proposed treatments of radial thinning/group selection around selected, large diameter ponderosa and sugar pines, as well as general stand thinning in pine components, should reduce the basal areas below the stated high risk threshold. This will lower the probability of successful western or mountain pine beetle attack and minimize the severity of inevitable beetle episodes. Tree density reduction improves tree vigor, likely increasing host defensive capability. It also alters that microhabitat, reducing beetle success likely by disrupting host-finding and chemically mediated aggregation via pheromones. Removal of dense understory vegetation around the base of large pines will increase air movement and turbulence, buffeting these weak-flying beetles and causing pheromone plume disruption in the area where mountain pine beetle attacks originate. The removal of the dense Douglas-fir crowns that currently envelop tall pine stems beginning about mid-bole will disrupt western pine beetle flight and host finding where this beetle species initiates its attacks. Radial thinning, as described in the Proposed Action Alternative, should prolong the lifespan of treated pines.

Thinning stands and reducing basal area not only minimizes the impact from tree-killing bark beetles, it can also reduce the influence of root diseases on stand structure. Armillaria root disease tends to attack trees that are under stress; reducing tree density will increase tree vigor and reduce root-to-root contacts and spread. However, it is important to avoid soil compaction and residual-tree wounding as these can exacerbate root disease on the site. Thinning in large clumps will provide opportunities for planting less-susceptible species. Sanitation removal of trees affected by laminated root rot will eliminate breeding habitat for Douglas-fir beetle. Creating openings in stands affected by laminated root rot will also allow for planting of less-susceptible species such as ponderosa and sugar pines; thinning may provide opportunities to plant the more shade-tolerant resistant species such as cedar.

We also walked to the fenced, former world champion ponderosa pine and observed, based on its faded foliage that the tree died recently. As such, it has high failure potential. Given it is over a well-maintained and signed trail and is a designated destination where visitors congregate, it has high damage potential. Under Regional policy guidelines, the tree should be considered high hazard and high priority for treatment. Should another champion ponderosa pine be designated, we recommend that, in advance of inviting the public to view the new champion, mitigation measures to minimize soil compaction on or near designated paths be considered. Raised walkways and trail placement well away from the trees roots are options.

The Southwest Oregon Forest Insect and Disease Service Center provides technical assistance and technology transfer on forest insects and tree diseases in Southwest Oregon. If you have questions on these observations or other forest health issues, please feel free to contact us at (541) 858-6125 or (541) 858-6124.

/s/ Bill Schaupp
BILL SCHAUPP
Entomologist/Plant Pathologist

/s/ Josh Bronson
JOSH BRONSON
Plant Pathologist

cc: Robert D Barnhart
Kenneth A Wearstler
Ellen M Goheen

Appendix C: Stand Exam Data Collection Procedures

Sample Intensity

One Plot every 5 acres of stand area: Exceptions:

- Minimum of 3 plots
- Stands less than 150 acres: Maximum of 12 plots
- Stand equal or greater than 150 acres: one plot for 10 acres
- The appropriate number of plots per stand will be rounded to the nearest whole number (less than half, rounded down; greater than half round up) Example :

    16/5 =3.2 : 3 plots are placed within the stand

    18/5 = 3.6 : 4 plots are placed within the stand

- Stand identification will use unit number and or Compartment and cell numbers from the managed stand attribute layer known as cellkey (use the last four numbers for stand number), if a cellkey number doesn't exist then use MSGA_ID for a stand number.

Plot Layout

- North/south, east west grid layout; no closer than 1 chain from stand boundary. Offset location as necessary
- Systematic, evenly distributed locations of plots throughout the entire extent of stand
- Distance between plot grid min 100 meters X 100 meters
- Reference point on the road nearest the stand ; record & readily identifiable on the ground (white flagging, include azimuth and distance to first sample plot with stand number and plot #, take GPS waypoint and reference point)
- GPS Plot center record lat, long on plot form, use white flagging for plot center with stand #, plot #, date and initials of crew

Sample Design (Stratification)

Complex Stands (multi-layer, Riparian Areas)

- Take spherical densitometer readings at the four cardinal directions record average Canopy Cover %
- 40 BAF Overstory and mid story variable plot sampling (trees >8")
- 5 BAF Snag sampling only (wildlife and Fuels)
- 100th acre plot 11.8 feet (adjust for slope) understory veg sampling
- ¼ acres - 58.9 feet Vegetation composition radius (adjust for slope) (wildlife needs)
- 50 foot Transect measure only 6" and greater Down Woody Debris (wildlife and Fuels)

Simplistic Stands or Young Stands (Single age class (post disturbance or clear cut) or two storied stands)

- 40 BAF Overstory and mid story variable plot sampling (trees >8")
- 5 BAF Snag sampling only (wildlife and fuels)
- 100th acre plot 11.8 feet (adjust for slope) understory veg sampling (trees < 7.9")

stand examination map is located in figure 1.

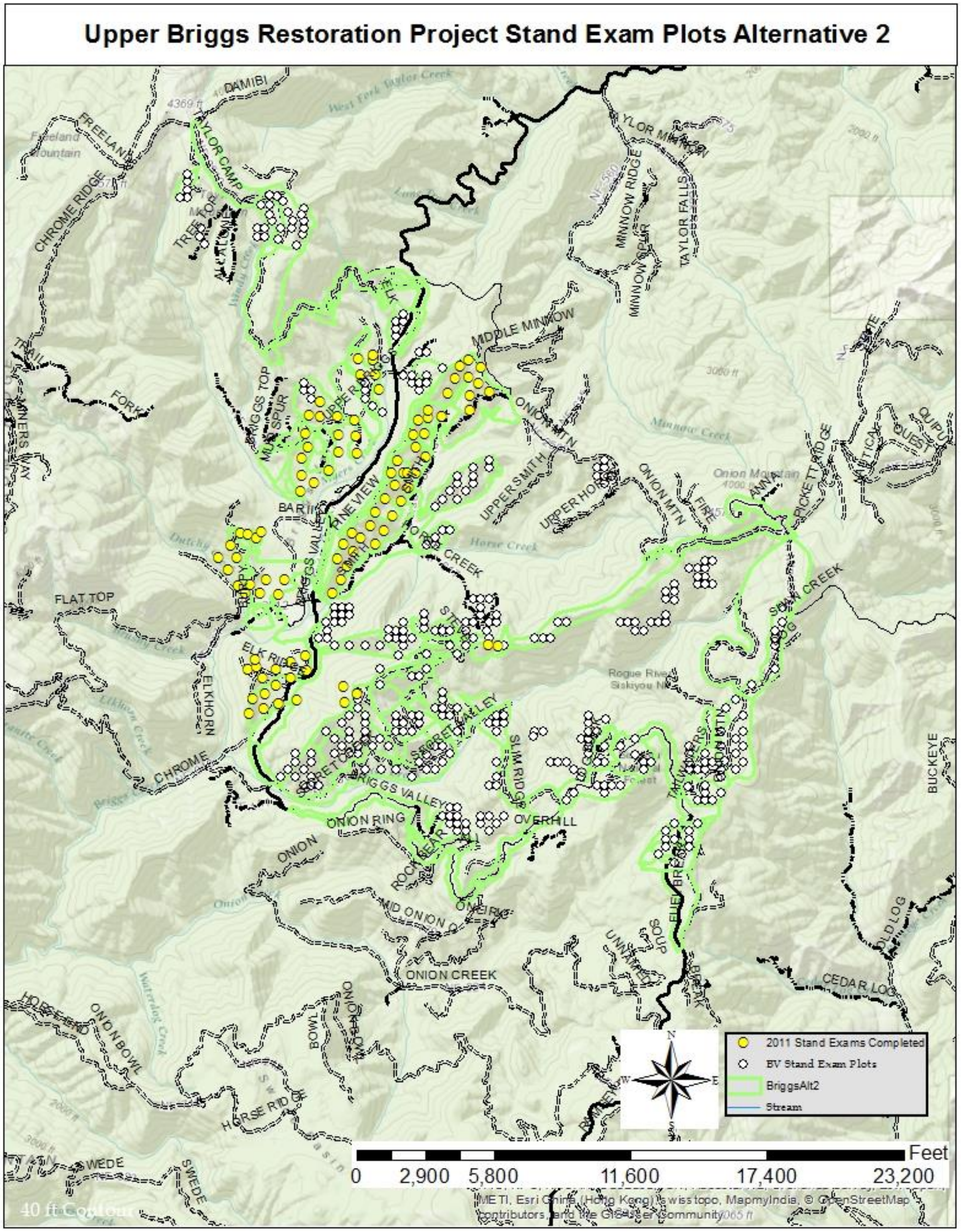


Figure 1. Stand Examination map of plots located within the proposed action.

The data collected during stand exams were entered into the Common Stand Exam database FSVeg and spatially linked in FSVeg Spatial. This data was used to infer data to uncollected stands located within the project area boundary using a Nearest Neighbor imputation process yaImpute in the FSVeg Spatial Data Analyzer. Stand exam data collected in 2011 was used from the Butcherknife Slate Hazardous Fuels Reduction project area which is the watershed immediately southeast of the Upper Briggs watershed. See the map below for plots used by the imputation process. Total Stand Exam plots used in the Nearest Neighbor Analysis = 461 Collection plots ranging from 2008, 2011, 2015

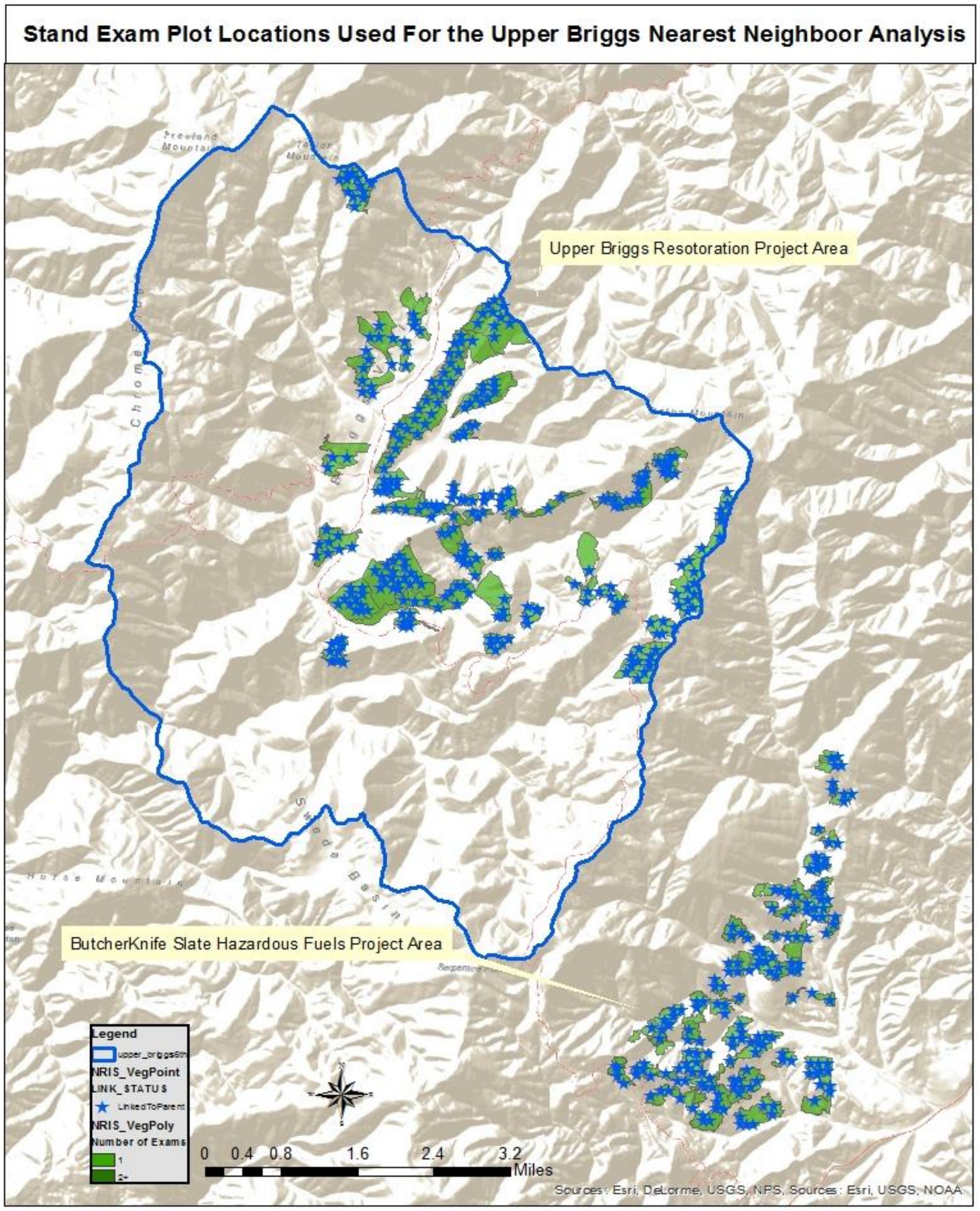


Figure 2. Stand examination plot data used in the FSVeg Spatial Data Analyzer Nearest Neighbor imputation.

The results of the imputation is located in figure 3 below.

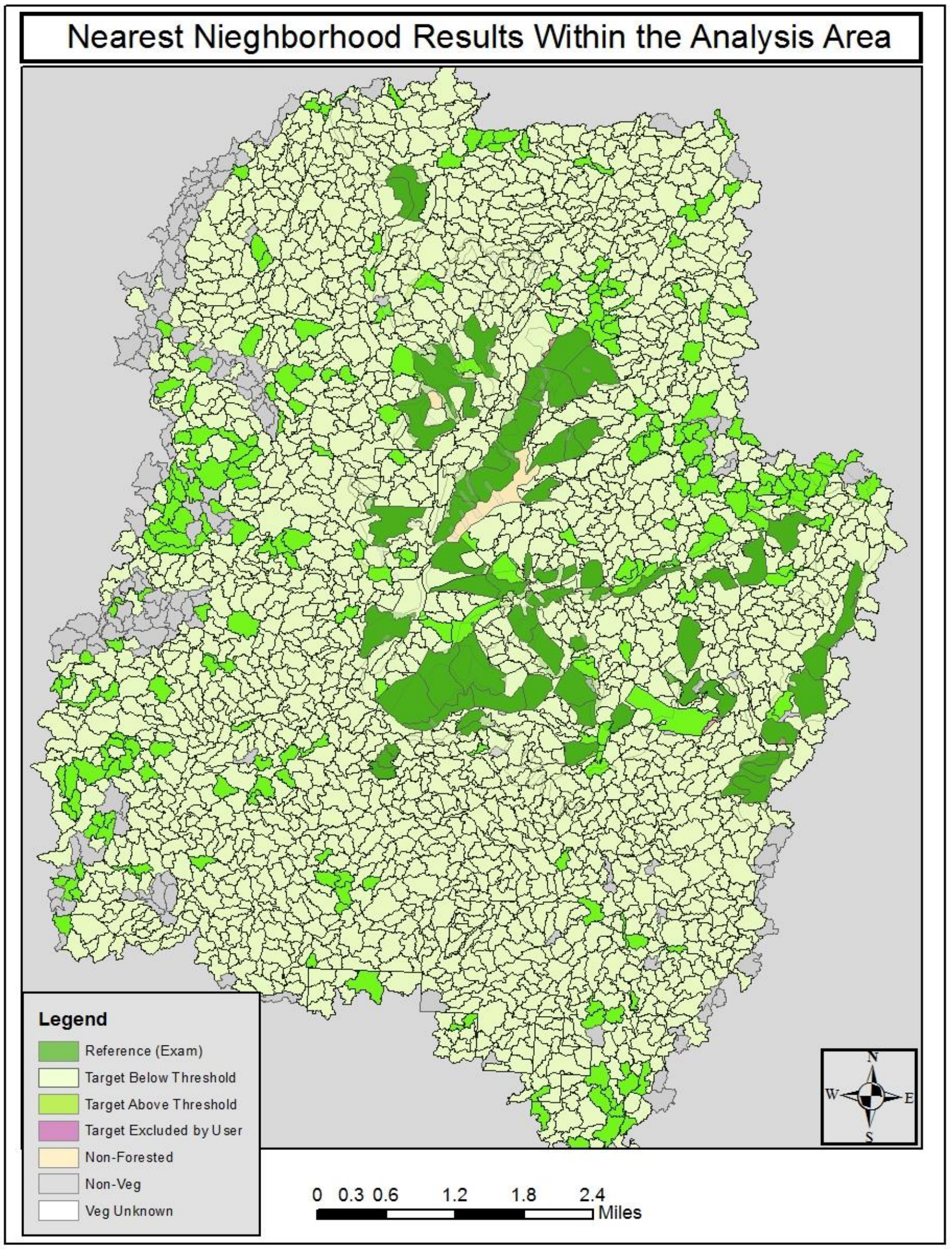


Figure 3. Nearest Neighborhood imputation results Upper Briggs watershed.

Multiple statistical analysis modeling methods were evaluated. The model of best fit was the Gradient Nearest Neighbor method with a threshold of 1.61. 89% of stands were found by the model to be statistically well represented. Based on the results, it was determined to move forward with evaluation/modeling of vegetation effects based upon treatment objectives.

Table 1. Comparison of Treatments for the Action Alternatives used to develop FVS simulation for Alt 2 and Alt 3.

DELSH	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
Canopy Cover Retention	No Cut	**NRF** 60% Canopy Cover Variable density thin "free thin"	**NRF** No Treat
		Dispersal 40% Canopy Cover Variable density thin "free thin"	**Dispersal** **Stands < 80** 40% Canopy Cover Variable density thin "free thin"
Hardwood Retention	No Cut	Hardwood retention >10" DRC	Hardwood retention >10" DRC
Fuels Treatment	No Cut	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment
Maximum Cut Limit	N/A	120 years of age	80 Years of age
Patchcut Size	No Cut	Dispersal units 3/4 acre max, 20% stand based upon existing vegetation	Dispersal units 3/4 acre max, 20% stand based upon existing vegetation
Treatment Method	N/A	Mechanically or Manually	Mechanically or Manually
Treatment Acres	**0**	**532**	**245**

DELSH /FMZ	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
Percent of unit cut	No Cut	**Ridgeline FMZ** 40% Canopy Cover Variable density thin "free thin"	**Natural Stands** thin from below maintain 60% Canopy Cover
		Roadside FMZ not on Ridgeline **NRF** 60% Canopy Cover Variable Density	**Roadside FMZ not on Ridgeline** **Natural Stands** thin from below maintain 60% Canopy Cover
		Dispersal 40% Canopy Cover	**Managed Stands** 40% Canopy Cover

		Variable density	Variable Density
Hardwood Retention	No Cut	Hardwood retention >10” DRC	Hardwood retention >10” DRC
Patchcut Size	No Cut	3/4 acre max, 20% stand based upon existing vegetation	3/4 acre max, 20% stand based upon existing vegetation
Fuels Treatment	No Cut	Prune 9*, 18* ft lift, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment
Maximum Cut Age Limit	N/A	120 years of age	80 years of age
Treatment Method	No Cut	Mechanically or Manually	Mechanically or Manually
Treatment Acres	**0**	**957**	**465**

Pine/ Oak Restoration Treatment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
Percent of unit cut	No Cut	40% Canopy Cover Variable density thin “free thin”	**Natural Stands** 60% Canopy Cover Remove (natural stands) **Managed Stands** 40% Canopy Cover
Patchcut Size	No Cut	3/4 acre, 20% stand based upon existing vegetation	3/4 acre, 20% stand based upon existing vegetation
Fuels Treatment	No Cut	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment
Maximum Cut Limit Age	N/A	120 years of age	80 years of age
Treatment Method	No Cut	Mechanically or Manually	Mechanically or Manually
Treatment Acres	**0**	**303**	**218**

Meadow Restoration Treatment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
Maximum Conifer Cut Limit	N/A	Remove all conifers retain hardwood >10” DRC	Remove all conifers retain hardwood >10” DRC
Maximum Cut Limit Age	N/A	120 years of age	80 years of age
Fuels Treatment	N/A	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment	Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment
Treatment Acres	**0**	**188**	**126**

Riparian Restoration Treatment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
Buffer Distance	No Cut	**Intermittent streams:** wetlands, unstable areas: 25 foot “no cut” buffer for channel protection and 100 foot infiltration buffer (to protect soils against compaction) **Perennial streams:** 25 foot “no cut” buffer for channel protection and 100 foot infiltration buffer (to protect soils against compaction). ● 25 to 85 foot - Primary Shade Zone (defined by tree height	120 foot stream buffer (no Action) 60% Canopy Cover Variable density thin “free thin” riparian upland >120 ft

Riparian Restoration Treatment	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Treatment
		and slope), provide overstory protection. Allow limited treatments in the understory. **Outside Primary Shade Zone** (i.e. Riparian Treatment Zone-Secondary Shade zone), implement 60% Canopy Cover Variable Density thin "free thin" Riparian upland	
Patchcut Size	No Cut	3/4 acre 20% stand based upon existing vegetation	3/4 acre 20% stand based upon existing vegetation
Fuels Treatment	No Cut	**Intermittent streams:** Prune, Pile and Burn ● **Perennial streams:** Primary Shade zone—Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment	≥120 feet: Prune, Pile and Burn 1 year post treat, Under Burn 1 to 5 years Post treatment
Hardwood Retention	No Cut	Hardwood retention >10" DRC	No Treat
Maximum Cut Limit Age	N/A	120 years of age	80 years of age
Treatment Method	No Cut	Mechanically or Manually	Mechanically or Manually
Treatment Acres	**0**	**957**	**451**

Table 2. Plant Associations and Plant Association Groups (PAG) Located in the Upper Briggs Restoration Proposed Action Area. FVS code is for the Inland California Northern Cascades variant.

OLDPA1996	Upper Briggs PA Occurrences		PAG Name	FVS Group Number	FVS Co
PIJE/CECU/FEID	Jeffrey pine/buckbrush/Idaho fescue	PIJE/CECU/FEID	Jeffrey pine/grass	5	CPG
PIJE/QUVA-ARNE			Jeffrey pine/shrub		
PIJE-CADE27-PSME			Jeffrey pine-incense cedar	4	CPG
PIJE-CADE27/ARVI4	Jeffrey pine-incense cedar/sticky whiteleaf manzanita	PIJE-CADE27/ARVI4			
PSME-CADE27/BEPI2			Douglas-fir/poison oak-warm, often low elevation	3	
PSME/DRY SHRUB	Douglas-fir/dry shrub	PSME/2SHRUB			CDS
PSME/HODI/WHMO-SWO	Douglas-fir/oceanspray/common whipplea	PSME/HODI/WHMO			CDS
PSME-ABCO/SYMO			Douglas-fir-canyon live oak-cool, dry - SWO	2	
PSME-QUCH2-LIDE3	Douglas-fir-canyon live oak-tanoak	PSME-QUCH2-LIDE3			CDS
PSME/ARNE-SWO	Douglas-fir/pinemat manzanita (southwest Oregon)	PSME/ARNE			CDC
LIDE3-ABCO/BENE2			Tanoak-canyon live oak and/or Sadler oak	1	
LIDE3-PSME-QUCH2/RHDI6	tanoak-Douglas-fir-canyon live oak/Pacific poison oak	LIDE3-PSME-QUCH2/TODI			Nor
ABCO-LIDE3/CHUM	white fir-tanoak/pipsissewa	ABCO-LIDE3/CHUM	White fir - cool, dry	6	
ABCO-PSME/ROGY	white fir-Douglas-fir/dwarf rose	ABCO-PSME/ROGY	White fir-Douglas-fir - warm, dry	7	

*Plant Association information defaulted to Douglas-fir.

FS Vegetation Data Analyzer Modeling Scenarios Discussion

FS Vegetation Data Analyzer was used to model effects of each objective by treatment type. Table 1 list the treatments that were modeled. Each modeling run used the same baseline information as set for the no action alternative. Vegetation information modified included max SDI computations in low high productivity sites that exceeded programed thresholds. Regeneration modeling was added to more represent the stands response to disturbance. This included tanoak response to decreases in stand density and fire. The modification were used in each additional alternative. Regeneration species was dependent on plant association information and the top three species found in the understory as determined by the 1996 plant association guide.

Appendix D – Re-vegetation Plan

Upper Briggs Restoration Project

PREPARED BY: /s/ Stuart Osbrack and /s/ Rob Barnhart DATE: January 26, 2017
District Botanist District Silviculturist

The proposed project area is vulnerable to both erosion and the establishment and spread of invasive plant infestations. Disturbed areas would be re-vegetated to prevent the establishment or spread of invasive plants and noxious weeds. Disturbed areas would also be re-vegetated for bank stabilization and erosion prevention. The following areas may be re-vegetated dependent on the requirement and need of each individual site influenced by the activity that would occur at these sites **Project would fund the re-vegetation of disturbed areas.**

- Culvert removal or replacements areas
- Areas with vegetation removal and canopy loss
- Decommissioned roads
- Roads placed into storage
- Staging areas
- Disturbed areas from project implementation
- Areas needing erosion control

The proposed project would fund the re-vegetation of the above areas.
Project implementation schedule must be communicated to District Botanist, District Silviculturist, and Forest Soil Scientist well in advance to facilitate rehabilitation and re-vegetation of sites. Adequate advance would have to allow enough time (one year minimum notice) to grow plants and/or purchase native plant materials from disease and weed free nurseries.

RE-VEGETATION SPECIES LISTS

All re-vegetation species would be native and be appropriate for the habitat type and elevation. Table 1: Re-vegetation species may include but not limited to the following:

Plant Species	**Comments**
Chamaecyparis lawsoniana (Port Orford Cedar)	Must be disease resistant stock and proper elevation band
Alnus rubra (Red alder)	Riparian species proper elevation band
Populus balsamifera ssp. trichocarpa (black cottonwood)	Riparian species proper elevation band
Fraxinus latifolia (Oregon ash)	Riparian species proper elevation band
Pinus lambertiana (sugar pine) Must be rust resistant stock	Upland species proper elevation band
Thuja plicata (western red cedar)	Riparian high elevation band
Abies magnifica (red fir)	Upland high elevation band
Acer macrophyllum (bigleaf maple)	Riparian species proper elevation band
Cornus sericea ssp. sericea (American dogwood)	Riparian species proper elevation band

Plant Species	Comments
Acer circinatum (vine maple)	Riparian species proper elevation band
Holodiscus discolor (ocean spray)	Upland species proper elevation band
Rhamnus californica (coffeeberry)	Upland species proper elevation band
Additional tree and shrub species	Species appropriate for site location plant community, habitat, and elevation
Native forb species	Species appropriate for site location plant community, habitat, and elevation
Native grass seed	Species appropriate for site location plant community, habitat, and elevation

RE-VEGETATION TIMING

Disturbed areas would be re-vegetated dependent on implementation timing. Factors for optimum results for successful survivability would be contingent on life form, species specific, and elevation bands. Re-vegetation would be could potentially be phased due to completion of implementation operations.

The first phase would include erosion control and invasive plant mitigations for establishment and spread of infestations. This phase would include planting of native grasses in disturbed areas and for slopes greater than 45% areas may be mulched with weed free straw or mulch.

Phase two would include planting trees, shrubs, and forbs. Phase two timing would conditional on growing season elevation bands.

Examples are: Disturbed sites with a July implementation completion would be planted with native grass seed (and possibly mulching) for preventing impacts during the initial period. The following spring Trees, shrubs, and forbs would be planted during the optimal establishment conditions.

RE-VEGETATION SITES

Re-vegetation would require site specific reconnaissance for stand typing to ensure the proper species mixture would be selected for the site. Site visits would also assess timing and planting conditions.

For culvert removal and replacement; roads that would be decommissioned; roads to be put into storage; and other disturbed sites the following general re-vegetation guidelines would be followed.

Re-vegetation Site Type	Comments and criteria
• Culverts replacement and removal areas would be re-vegetated with the riparian native tree, shrub, forb, or grass species listed.	• Resistant Port Orford Cedar would be used at least 25 feet above the stream and 25 between seedlings to prevent

	spores migrating with water into their root system.(approx.. 70 trees/acre) • Other riparian tree and shrub species can be planted in disturbed areas and to the stream channel • Tree and shrubs will be planted in all disturbed areas to minimize soil erosion into stream channel and provide bank stability. Grass and forbs could be utilized for appropriate site needs
• Decommissioned roads would be seeded with the appropriate native grass seeds and/or trees and shrubs	• The first 100 feet or wherever this is ripping and re-contouring would be seeded with native grass seed • Areas with slopes over 45 percent may be seeded with native grass seed and mulched with weed free mulch and/or planted with the appropriate trees, shrubs, or herbs for the habitat. • If road is ripped and re-contoured beyond
• Staging areas or other disturbed areas	• Would be planted with the appropriate tree, shrub, herb, or grass species dependent on habitat, soils, elevation, and disturbance area.

POC planting instructions

- Plant resistant stock POC in their respective planting zones. Follow the breeding zone map for stock placement.
- Plant resistant stock only in un-infested sites where POC normally occurs.
- Space POC seedlings 25 feet from water sources and 25 foot spacing. See below figure for example of planting in riparian zone.

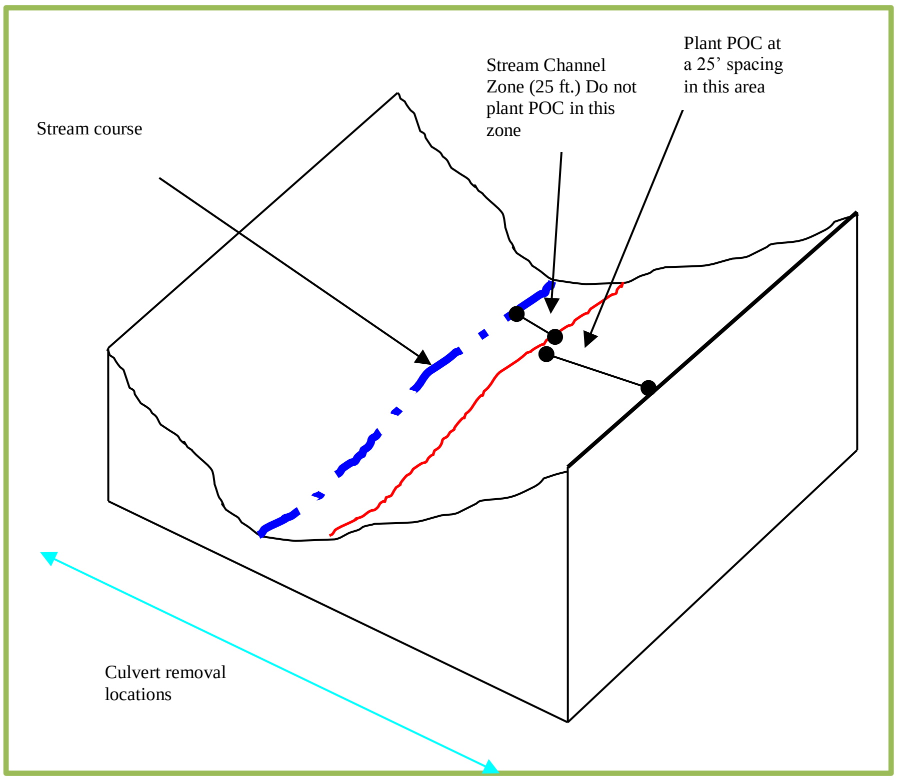


Figure 3-1. POC planting location diagram for culvert removal locations